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OF LONDON  
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1880.

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1880.

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# LIST

## OF THE

### CONTRIBUTORS,

*With References to the several Articles contributed by each.*

	Page
<hr style="width: 20%; margin: 10px auto;"/>	
AGASSIZ, ALEXANDER, F.M.Z.S.	
Note on some Points in the History of the Synonymy of Echini .....	33
ALSTON, EDWARD R., F.L.S., F.Z.S., &c.	
Exhibition of, and remarks upon, a drawing of <i>Tapirus</i> <i>dowi</i> .....	187
Exhibition of, and remarks upon, a remarkable and little- known Australian Marsupial ( <i>Antechinomys lanigera</i> ) ....	187
On <i>Antechinomys</i> and its Allies. (Plate XLV.).....	454
ALSTON, EDWARD R., F.L.S., F.Z.S., &c., and DANFORD, CHARLES G., F.Z.S.	
On the Mammals of Asia Minor. Part II. (Plate V.)..	50
ANGAS, GEORGE FRENCH, F.L.S., F.R.G.S., C.M.Z.S., &c.	
Further Additions to the Marine Molluscan Fauna of South Australia, with Descriptions of new Species. (Plate XL)..	415
Descriptions of three Species of Marine Shells from Port Darwin, Torres Straits, discovered by Mr. W. T. Bednall, and of a new <i>Helix</i> from Kangaroo Island, South Australia. (Plate XL.) .....	418

BEDDOME, Col. R.A., C.M.Z.S.

Description of a new Snake of the Genus <i>Plectrurus</i> from Malabar .....	182
---	-----

BELL, F. JEFFREY, B.A., F.R.M.S., F.Z.S., Professor of  
Comparative Anatomy in King's College, London.

On <i>Palæolampas</i> , a new Genus of the Echinoidea. (Plate IV.) .....	43
---	----

On the Names to be applied to certain Echinoidea .....	220
--	-----

Exhibition of, and remarks upon, an immature specimen of an Echinoid .....	356
---	-----

Observations on the Characters of the Echinoidea.—III. On some Genera and Species of the <i>Temnopleuridæ</i> . (Plate XLI.)	422
---	-----

BLANFORD, W. T., F.R.S., F.G.S., F.Z.S., &c.

Remarks upon the Himalayan Marmots now living in the Society's Gardens .....	453
---	-----

See also HUBRECHT, A. A. W.

BOULENGER, G. A., Aide-Naturaliste at the Royal Museum  
of Belgium.

On the Palæarctic and Æthiopian Species of <i>Bufo</i> . (Plates L.—LII.) .....	545
--	-----

BROWN, ARTHUR E.

Letters from, relating to the birth of an Elephant in a menagerie at Philadelphia. ....	222
--	-----

BUTLER, ARTHUR GARDINER, F.L.S., F.Z.S., Assistant Keeper,  
Zoological Department, British Museum.

On new and little-known Butterflies from India. (Plate XV.) .....	147
--	-----

Description of a new Species of Orthopteron of the Genus <i>Anostostoma</i> from Madagascar .....	152
--	-----

On a Collection of Lepidoptera from Candahar. Plate XXXIX.) .....	403
---	-----

On a second Collection of Lepidoptera made in Formosa by H. E. Hobson, Esq. ....	666
--	-----

CAMBRIDGE, REV. O. PICKARD, M.A., C.M.Z.S., Hon. Mem.  
New-Zealand Institute.

On some new and little-known Spiders of the Genus <i>Argyroides</i> , Sim. (Plates XXVIII.—XXX.) .....	320
--	-----

CRAVEN, ALFRED E., F.R.G.S., F.G.S., F.L.S., F.Z.S.

Description of three new Species of Land and Freshwater Shells from Nossi-Bé Island (N.W. Coast of Madagascar). (Plate XXII.) .....	215
---	-----

On a Collection of Land and Freshwater Shells made during a short Expedition to the Usambara Country in Eastern Africa, with Descriptions of seven new Species. (Plate XXII.) .....	216
---	-----

On a Collection of Land and Freshwater Shells from the Transvaal and Orange Free State in South Africa, with Descriptions of nine new Species. (Plate LVII.) ..	614
---	-----

Description of three new Species of Land-Shells from Cape Colony and Natal. (Plate LVII.) .....	618
---	-----

DANFORD, CHARLES G., F.Z.S., and ALSTON, EDWARD R.,  
F.L.S., F.Z.S., &c.

On the Mammals of Asia Minor.—Part II. (Plate V.) ....	50
--	----

DAY, FRANCIS, F.Z.S. &c.

On the Fishes of Afghanistan .....	224
------------------------------------	-----

On a new Entomostrakon from Afghanistan .....	392
---	-----

DISTANT, W. L., and GODMAN, F. DuCANE, F.L.S., F.Z.S.

Descriptions of five new Species of Rhopalocera from East Africa. (Plate XIX.) .....	182
--	-----

DOBSON, G. E., M.A., M.B., F.L.S., &c.

Exhibition of a new *Megaderma*, proposed to be called  
*M. gigas* ..... 421

Description of a new Species of the Genus *Natalus* (Ves-  
pertilionidæ) from Jamaica ..... 443

On some new or rare Species of Chiroptera in the Col-  
lection of the Göttingen Museum. (Plate XLVI.) ..... 461

Exhibition of a malformed head of a Partridge ..... 539

ELLIOT, Sir WALTER, K.C.S.I., F.R.S., F.Z.S.

Notes on the Indian Bustard (*Eupodotis edwardsi*), with  
especial reference to its Gular Pouch ..... 486

FINSCH, OTTO, Ph.D., C.M.Z.S., &c., late Director of the  
Zoological Museum of Bremen.

A List of the Birds of the Island of Ruk, in the Central  
Carolines ..... 574

On two Species of Pigeons from the Caroline Islands . . . 577

FLOWER, WILLIAM HENRY, LL.D., F.R.S., F.L.S., President  
of the Society, Conservator of the Museum of the Royal  
College of Surgeons, and Hunterian Professor.

Exhibition of, and remarks upon, the skull of a two-horned  
Rhinoceros from Borneo ..... 69

On the Bush-Dog (*Icticyon venaticus*, Lund). (Plate X.) 70

Remarks on the exhibition in London of an example of  
the Lesser Fin-Whale ..... 358

FORBES, WILLIAM ALEXANDER, B.A., F.L.S., F.Z.S., Scholar  
of St. John's College, Cambridge, Prosector to the  
Society.

On some Points in the Structure of *Nasiterna* bearing on  
its Affinities ..... 76

Contributions to the Anatomy of Passerine Birds.—Part I.	
On the Structure of the Stomach in certain Genera of Tanagers.	143
Notice of a Memoir on the male generative organs of the Sumatran Rhinoceros .....	188
Remarks upon the cause of death of a Leopard in the Society's Menagerie .....	358
Contributions to the Anatomy of Passerine Birds.—Part II.	
On the Syrinx and other Points in the Anatomy of the <i>Eurylæmide</i> .....	380
Contributions to the Anatomy of Passerine Birds.—Part III.	
On some Points in the Structure of <i>Philepitta</i> , and its Position amongst the Passeres.....	387
On the Anatomy of <i>Leptosoma discolor</i> .....	465
On two rare Ploccine Birds now or lately living in the Society's Menagerie. (Plate XLVII.) .....	475
Note on a Specimen of Denham's Bustard ( <i>Eupodotis denhami</i> ) .....	477
Exhibition of drawings of the horns of the Prongbuck, and remarks upon the shedding of the horns of this animal ....	540
On the External Characters and Anatomy of the Red Uakari Monkey ( <i>Brachyurus rubicundus</i> ); with Remarks on the other Species of that Genus. (Plates LXI.—LXIII.) ..	627
GODMAN, FREDERICK DUCANE, F.L.S., F.Z.S., and DISTANT, W. L.	
Descriptions of five new Species of Rhopalocera from East Africa. (Plate XIX.) .....	182
GODMAN, FREDERICK DUCANE, F.L.S., F.Z.S., and SALVIN, OSBERT, M.A., F.R.S., F.Z.S.	
Descriptions of some supposed new Species of Butterflies from New Guinea. (Plate LVI.) .....	609

GODWIN-AUSTEN, Lieut.-Col. H. H., F.R.S., F.Z.S., F.R.G.S.,  
&c.

On the Land-Molluscan Genus *Girasia* of Gray, with Remarks on its Anatomy, and on the Form of the Capreolus of Lister (or Spermatophore), as developed in Species of this Genus of Indian Helicidæ. (Plates XXIV.-XXVII.) . . . . 289

GODWIN-AUSTEN, Lieut.-Col. H. H., F.R.S., F.Z.S., &c., and  
NEVILL, G., C.M.Z.S.

On the Anatomy of *Ferussacia gronoviana*, Risso, from Mentone. By Lieut.-Col. H. H. GODWIN-AUSTEN. Concluding with a note on the Classification of the Genus and its Allies, by GEOFFREY NEVILL. (Plate LXIV.) . . . . 662

GÜNTHER, ALBERT, M.D., Ph.D., F.R.S., F.Z.S., Keeper  
of the Zoological Department, British Museum.

Description of two new Species of Dwarf Antelope (*Neotragus*) . . . . . 17

Exhibition of a drawing of an example of *Holacanthus tricolor* said to have been obtained on the coast of the island of Lewes. . . . . 23

Note respecting the occurrence of *Holacanthus tricolor* in the Western Isles . . . . . 356

Notes on some Japanese Mammalia. (Plate XLII.) . . . 410

Exhibition of, and remarks upon, a series of horns of *Cervus equinus* . . . . . 452

Notice of a Memoir on some rare Reptiles and Batrachians now or lately living in the Society's Menagerie . . . . . 648

GURNEY, JOHN HENRY, F.Z.S.

Note on the Immature Plumage of *Dryotriorchis spectabilis* (Schleg.). (Plate LVIII.) . . . . . 621

HAAST, Professor JULIUS VON, Ph.D., F.R.S., C.M.Z.S., Director of the Canterbury Museum, Christchurch, New Zealand.

On *Ziphius novæ-zealandiæ*. (Plate XXIII.) . . . . . 232



## HARTING, JAMES EDMUND, F.Z.S.

- Exhibition of, and remarks upon, a specimen of Bartram's Sandpiper, supposed to have been killed in Lincolnshire. . . . 543

## HARTLAUB, Dr. G., F.M.Z.S.

- On a new Species of Heron from Mohambo in Northern Madagascar . . . . . 39

- On some new Birds discovered and collected by Dr. Emin Bey in Central Africa, between 5° and 2° N. lat., and 31° and 32° E. long. (Plate LX.) . . . . . 624

## HEYSHAM, Col.

- Extract from a letter, addressed to the President, containing remarks upon two cases of Elephants breeding in captivity . . . . . 23

## HOFFMAN, W. J., M.D.

- On a supposed Instance of Hybridization between a Cat and a Lynx . . . . . 380

## HOLDSWORTH, E. W. H., F.L.S., F.Z.S., &amp;c.

- Note on the Distribution of the Crayfish (*Astacus*) in Spain . . . . . 421

## HUBRECHT, A. A. W.

- On a Collection of Reptiles and Amphibians from Baluchistan made by Dr. C. Duke in April and May, 1877. With a note by W. T. BLANFORD, F.Z.S. . . . . 620

## HUXLEY, THOMAS H., LL.D., Sec.R.S., V.P.Z.S.

- On the Cranial and Dental Characters of the Canidæ. . . . 238

- On the Application of the Laws of Evolution to the Arrangement of the Vertebrata, and more particularly of the Mammalia . . . . . 649

## JACOBY, MARTIN.

- Descriptions of new Species of Phytophagous Coleoptera. (Plate XVIII.) . . . . . 166

	Page
On a Collection of Phytophagous Coleoptera made by Mr. Buckley in Eastern Ecuador. (Plates LIV. & LV.) ..	588
LEGGE, Captain W. VINCENT, R.A., F.Z.S.	
Exhibition of, and remarks upon, a series of specimens of Little Ringed Plovers from Ceylon and Central India. ....	38
LILFORD, THOMAS LYTTLETON, Lord, F.Z.S. &c.	
Exhibition of some specimens of hybrid Pheasants .....	421
On the Breeding of the Flamingo in Southern Spain ....	446
MIVART, St. GEORGE, Ph.D., F.R.S., F.Z.S., M.R.I., &c.	
Note on the Discovery of living Medusæ in the Botanical Society's Gardens, Regent's Park. ....	454
MOORE, FREDERIC, F.Z.S.	
Notice of a Memoir on the Indian genera and species of the Lepidopterous subfamily <i>Ophiderinæ</i> .....	27
MOSELEY, H. N., F.R.S.	
Exhibition of, and remarks upon, some specimens of sections of Corals .....	24
Description of a new Species of Simple Coral .....	41
MULVANY, Dr. R. N.	
Remarks upon the probability of a moulting of the horny sheath of the beak of the Penguin .....	2
NEVILL, GEOFFREY, C.M.Z.S.	
On the Land-Shells, extinct and living, of the Neighbour- hood of Menton (Alpes Maritimes) ; with Descriptions of a new Genus and of several new Species. (Plates XIII., XIV.)	94
NEVILL, GEOFFREY, C.M.Z.S., and GODWIN-AUSTEN, Lieut.- Col. H. H., F.R.S., F.Z.S., &c.	
On the Anatomy of <i>Ferussacia gronoviana</i> , Risso, from Mentone. By Lieut.-Col. H. H. GODWIN-AUSTEN. Con- cluding with a Note on the Classification of the Genus and its Allies, by GEOFFREY NEVILL. (Plate LXIV.) .....	662

	Page
NEWTON, ALFRED, M.A., F.L.S., F.Z.S., Professor of Zoology and Comparative Anatomy in the University of Cam- bridge.	
Remarks on a specimen of the "Needle-tailed Swallow" of Latham shot near Ringwood, Hants.....	1
O'SHAUGHNESSY, A. W. E., Assistant in the Natural-History Departments of the British Museum.	
Description of a new Species of <i>Uromastix</i> . (Plate XLIII.)	445
Description of a new Species of <i>Anolis</i> , with Notice of some other Species of that Genus from Ecuador. (Plate XLIX.) .....	491
OWEN, Prof. RICHARD, C.B., D.C.L., F.R.S., F.L.S., F.Z.S., &c.	
Notice of a Memoir on the new and little-known species of Cephalopoda .....	288
On the External and Structural Characters of the Male <i>Spirula australis</i> , Lam. (Plate XXXII.) .....	352
PARKER, W. K., F.R.S., F.Z.S., &c.	
Exhibition of, and remarks upon, the eggs and embryos of some Crocodiles. ....	186
Abstract of a Memoir on the structure of the skull in the Chameleons .....	188
Abstract of a Memoir on the development of the skull in the Urodele Batrachians .....	544
POWELL, WILFRED.	
Field-notes on the Morroop ( <i>Casuarinus bennetti</i> ) of New Britain .....	493
PRYER, W. B.	
Letter from, addressed to the Secretary, containing remarks on the animals of Sandakan, N. Borneo .....	68

RAMSAY, R. G. WARDLAW, F.Z.S., M.B.O.U., Lieutenant 67th Regiment.	
Contributions to the Ornithology of Sumatra.—Report on a Collection from the neighbourhood of Padang. (Plate I.).	13
SALVIN, OSBERT, M.A., F.R.S., F.Z.S., and GODMAN, FREDERICK DU CANE, F.L.S., F.Z.S.	
Descriptions of some supposed new Species of Butterflies from New Guinea. (Plate LVI.)	609
SALVIN, OSBERT, M.A., F.R.S., F.Z.S., and SCLATER, P. L., M.A., Ph.D., F.R.S.	
On new Birds collected by Mr. C. Buckley in Eastern Ecuador. (Plates XVI. & XVII.)	155
SAUNDERS, HOWARD, F.L.S., F.Z.S., &c.	
On the Sea-birds obtained during the Voyage of Lord Lindsay's Yacht 'Venus' from Plymouth to Mauritius in 1874	161
SCHMIDT, DR. MAX, Director of the Zoological Gardens, Frankfort-on-the Main.	
On the Duration of Life of the Animals in the Zoological Garden at Frankfort-on-the-Main.	299
SCLATER, PHILIP LUTLEY, M.A., Ph.D., F.R.S., Secretary to the Society.	
Report on the additions to the Society's Menagerie in December 1879, and remarks upon two rare species of <i>Chrysotis</i> . (Plate II.)	22
Exhibition of an egg of the Mooruk	27
Remarks on some Species of the Genus <i>Tyrannus</i> . (Plate III.)	28
On a Fifth Collection of Birds made by the Rev. G. Brown, C.M.Z.S., on Duke-of-York Island and its Vicinity. (Plates VI.—VIII.)	65

Report on the additions to the Society's Menagerie in January 1880, and Exhibition of a drawing of an undescribed Parrot of the genus <i>Chrysotis</i> living in the Society's Gardens. (Plate IX.) .....	67
Remarks upon the probable identity of <i>Colobus palliatus</i> , Peters, with <i>C. angolensis</i> , Schl.....	68
Report on the additions to the Society's Menagerie in February 1880 .....	186
Report on the additions to the Society's Menagerie in March 1880 .....	288
Report on the additions to the Society's Menagerie in April 1880.....	355
Exhibition of, and remarks upon, an Ibis ( <i>Geronticus comatus</i> ).....	356
Remarks on animals observed in the Zoological Gardens of Berlin, Hamburg, Amsterdam, The Hague, and Antwerp	420
Exhibition of a Spider of the Genus <i>Tegenaria</i> , forwarded to him from Cape Town by J. H. Payne .....	421
Report on the additions to the Society's Menagerie in May 1880, and description of a new Lemur ( <i>Lemur nigerrimus</i> )..	450
Exhibition of, and remarks upon, an apparently new Species of Antelope. (Plate XLIV.) .....	452
List of the certainly known Species of <i>Anatidæ</i> , with Notes on such as have been Introduced into the Zoological Gardens of Europe, and Remarks on their Distribution ....	496
Report on the additions to the Society's Menagerie in June, July, August, September, and October 1880.....	537
Exhibition of, and remarks upon, a skin of <i>Numida elliotti</i> .	539
Report on the additions to the Society's Menagerie in November 1880 .....	648
Exhibition of, and remarks upon, an example of <i>Pauxis galeata</i> .....	648

SCLATER, P. L., M.A., Ph.D., F.R.S., and SALVIN, OSBERT, M.A., F.R.S., F.Z.S.	
On new Birds collected by Mr. C. Buckley in Eastern Ecuador. (Plates XVI. & XVII.)	155
SMITH, EDGAR A., F.Z.S., Zoological Department, British Museum.	
On the Shells of Lake Tanganyika and of the Neighbour- hood of Ujiji, Central Africa. (Plate XXXI.)	344
Descriptions of twelve new Species of Shells. (Plate XLVIII.)	478
On the Genus <i>Myodora</i> of Gray. (Plate LIIL.)	578
STEEL, JOHN HENRY, M.R.C.V.S., F.Z.S., Demonstrator of Anatomy at the Royal Veterinary College.	
Preliminary Notes on Individual Variation in <i>Equus asinus</i> .	2
TACZANOWSKI, L., C.M.Z.S.	
Liste des Oiseaux recueillis au Nord du Pérou par M. Stolzmann pendant les derniers mois de 1878 et dans la première moitié de 1879. (Plates XX. & XXI.)	189
TEGETMEIER, W. B., F.Z.S.	
On the Synonymy of the Kaffir Crane.	93
THOMAS, OLDFIELD, F.Z.S., Assistant in the Zoological Department, British Museum.	
Description of a new Species of <i>Mus</i> from the Fiji Islnds.	11
On the <i>Myoxus elegans</i> of Temminck	40
On Mammals from Ecuador. (Plate XXXVIII.)	393
Description of a new Species of <i>Reithrodon</i> , with Remarks on the other Species of the Genus	691

	Page
TRIMEN, ROLAND, F.L.S., F.Z.S., &c., Curator of the South-African Museum, Cape Town.	
On a new Species of Roller ( <i>Coracias</i> ) from the Zambesi..	30
On an undescribed <i>Laniarius</i> from the Interior of Southern Africa. (Plate LIX.) .....	623
WALSINGHAM, THOMAS, Lord, F.Z.S.	
On some new and little known Species of <i>Tineidæ</i> . (Plates XI. & XII.) .....	77
WATERHOUSE, F. H., A.L.S., Librarian to the Society.	
On the Dates of Publication of the Parts of Sir Andrew Smith's 'Illustrations of the Zoology of South Africa' ....	489
WATSON, MORRISON, M.D.	
Notice of a Memoir on the Female Organs of the Proboscidea as observed in a specimen of the Indian Elephant ....	288
WESTWOOD, Professor J. O., M.A., F.L.S., &c.	
A Monograph of the Sawflies composing the Australian Genus <i>Perga</i> of Leach. (Plates XXXIII.-XXXVII.) ....	359
WHITE, E. W., F.Z.S.	
Notes on <i>Chlamydophorus truncatus</i> .....	8

## ERRATA.

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A mistake has been made as regards the lettering of fig. 3 in Mr. Forbes's paper on *Leptosoma* (*suprà*, p. 472). The figure is therefore reprinted here corrected.

Fig. 3.

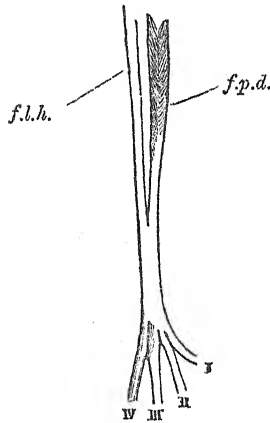


Diagram of the arrangement of the deep plantar tendons in *Leptosoma*.  
*f.l.h.*, the *flexor longus hallucis*; *f.p.d.*, the *flexor profundus digitorum*.

Also, in the last line of the note on the same page, the inverted commas should have been placed *after* instead of *before* the word same (*lege* same "blended").



# LIST OF PLATES.

1880.

Plate		Page
I.	<i>Myiophonus castaneus</i> .....	13
II.	<i>Chrysotis erythrura</i> .....	23
III.	<i>Tyrannus niveigularis</i> .....	28
IV.	<i>Palæolampus crassa</i> .....	43 <sup>3</sup>
V.	<i>Arvicola quentheri</i> .....	50
VI.	<i>Megalurus interscapularis</i> .....	65
VII.	Fig. 1. <i>Pacilodryas æthiops</i> . Fig. 2. <i>Munia melæna</i> }	
VIII.	<i>Rallus insignis</i> .....	68
IX.	Fig. 1. <i>Chrysotis caligena</i> . Fig. 2. <i>C. dufresniana</i> ..	
X.	<i>Icticyon venaticus</i> .....	70
XI.	} New species of <i>Tineidæ</i> .....	77
XII.		
XIII.	} Land-Shells from Menton .....	94
XIV.		
XV.	New Indian Butterflies.....	147
XVI.	<i>Ptilochloris buckleyi</i> , ad. et pull. ....	155
XVII.	<i>Grallaria dignissima</i> .....	
XVIII.	New Phytophagous Coleoptera .....	166
XIX.	East-African Rhopalocera .....	182
XX.	<i>Turdus maranonicus</i> .....	189
XXI.	<i>Conothraupis speculigera</i> .....	
XXII.	New Shells from Nossi-Bé Island and East Africa ..	215
XXIII.	<i>Ziphius novæ-zealandiæ</i> .....	232
XXIV.	} The Land-Molluscan genera <i>Girusia</i> and <i>Austenia</i> ..	289
XXV.		
XXVI.		
XXVII.		
XXVIII.	} Spiders of the genus <i>Argyrodes</i> .....	320
XXIX.		
XXX.		
XXXI.	Shells from Ujiji and Lake Tanganyika .....	344
XXXII.	Anatomy of <i>Spirula</i> .....	352

Plate		Page
XXXIII.	Details of Australian Species of <i>Perga</i> .....	359
XXXIV.	} Australian Species of <i>Perga</i> .....	
XXXV.		
XXXVI.		
XXXVII.		
XXXVIII.	<i>Bassaricyon alleni</i> .....	393
XXXIX.	Lepidoptera from Candahar.....	403
XL.	New Shells from Port Darwin and South Australia.....	415, 418
XLI.	Tests of Temnopleuridæ .....	422
XLII.	Fig. A. <i>Neürotrichus gibbsii</i> } Fig. B. <i>Urotrichus talpoides</i> }	440
XLIII.	<i>Uromastix princeps</i> .....	445
XLIV.	<i>Tragelaphus gratus</i> .....	452
XLV.	<i>Antechinomys laniger</i> .....	454
XLVI.	<i>Magaderma gigas</i> .....	461
XLVII.	Fig. 1. <i>Vidua splendens</i> } Fig. 2. <i>Pytelia wieneri</i> }	475
XLVIII.	New Species of Shells from various Localities .....	478
XLIX.	<i>Anolis buckleyi</i> .....	491
L.	<i>Bufo viridis</i> .....	545
LI.	<i>Bufo mauritanicus</i> .....	
LII.	<i>Bufo regularis</i> .....	
LIII.	Species of <i>Myodora</i> .....	578
LIV.	New Phytophagous Coleoptera.....	588
LV.	New Phytophagous Coleoptera .....	
LVI.	New Butterflies from New Guinea .....	609
LVII.	New African Shells .....	614
LVIII.	<i>Dryotriorchis spectabilis</i> .....	621
LIX.	<i>Laniarius atrocroceus</i> .....	623
LX.	Fig. 1. <i>Fminia lepida</i> . Fig. 2. <i>Drymoeichlu incana</i> ..	624
LXI.	<i>Brachyurus rubicundus</i> .....	627
LXII.	Head of <i>Brachyurus rubicundus</i> .....	
LXIII.	<i>Brachyurus melanocephalus</i> .....	
LXIV.	Anatomy of <i>Ferussacia gronoviana</i> .....	662

# LIST OF WOODCUTS.

1880.

	Page
Right pes of <i>Mus huegeli</i> .....	12
Head of <i>Neotragus kirkii</i> .....	17
Skull of <i>Neotragus kirkii</i> (side view) .....	19
Skull of <i>Neotragus saltianus</i> .....	19
Skull of <i>Neotragus kirkii</i> (upper view) .....	20
Upper view of facial bone of <i>Neotragus saltianus</i> .....	20
Fore part of skull of <i>Neotragus damarensis</i> (side view) .....	21
Snout of <i>Neotragus damarensis</i> (upper and lower views) ..	21
Snout of <i>Neotragus saltianus</i> (lower view) .....	21
Posterior mandibular molar of <i>Neotragus saltianus</i> .....	22
Posterior mandibular molar of <i>Neotragus damarensis</i> .....	22
Tail-end of <i>Tyrannus albigularis</i> .....	29
Wing-end of <i>Tyrannus albigularis</i> .....	29
Wing-end of <i>Tyrannus niveigularis</i> .....	30
Terminal portion of tail of <i>Coracias spatulatus</i> .....	32
<i>Desmophyllum lamprotichum</i> .....	42
<i>Ovis gmelini</i> , from Erzerroom (front view) .....	56
<i>Ovis gmelini</i> , from the Cilician Taurus (front views) .....	56
<i>Ovis gmelini</i> , from Erzerroom (side view) .....	57
<i>Ovis gmelini</i> , from the Cilician Taurus (side views) .....	57
Upper and lower molars of <i>Arvicola guentheri</i> .....	63
Sole of hind foot of <i>Arvicola guentheri</i> .....	63
Under surface of right fore foot of <i>Icticyon</i> .....	72
Under surface of right hind foot of <i>Icticyon</i> .....	72
Cæcum of <i>Icticyon</i> .....	73
Liver of <i>Icticyon</i> (upper and under surfaces) .....	74
Brain of <i>Icticyon</i> (upper surface and side view) .....	75
Stomach of <i>Tachyphonus melaleucus</i> .....	143
Stomach of <i>Euphonia violacea</i> .....	145
<i>Anostostoma alatum</i> .....	153
Dorsal view of the left half of the skull of <i>Canis azaræ</i> .....	241
Dorsal view of the right half of the skull of <i>Canis vulpes</i> .....	241

	Page
Lateral view of the skull of <i>Canis azaræ</i> .....	242
Lateral view of the skull of <i>Canis vulpes</i> .....	242
Crowns of the cheek-teeth of <i>Canis azaræ</i> and <i>C. vulpes</i> .....	243
Longitudinal sections of the skulls of <i>Canis azaræ</i> and <i>C. vulpes</i> ..	246
Superimposed outlines of the casts of the cranial cavities of <i>Canis azaræ</i> and <i>C. vulpes</i> .....	247
Crowns of the cheek-teeth of <i>Canis argentatus</i> and <i>C. littoralis</i> .....	249
Upper and lower cheek-teeth of <i>Canis lupus</i> and <i>C. azaræ</i> .....	250
Dorsal aspect of the right half of the skull of <i>Canis azaræ</i> .....	251
Dorsal aspect of the left half of the skull of <i>Canis littoralis</i> .....	251
The left ramus of the mandible of <i>Canis azaræ</i> , <i>C. littoralis</i> , and <i>C. fulvipes</i> .....	252
Dorsal view of the skull of <i>Canis fulvipes</i> .....	254
Dorsal view of the skull of <i>Otocyon lalandii</i> .....	257
Lateral view of the skull of <i>Otocyon lalandii</i> .....	258
Lower and upper cheek-teeth of <i>Otocyon lalandii</i> .....	260
Lower sectorial tooth of <i>Otocyon lalandii</i> , <i>Canis zerda</i> , and <i>C. lupus</i> ..	260
Right ramus of the mandible of <i>Perameles</i> , <i>Procyon</i> , and <i>Otocyon</i> ..	263
Side view of the skull of <i>Icticyon venaticus</i> .....	268
Upper and lower cheek-teeth of <i>Icticyon venaticus</i> .....	269
The Koala .....	355
Left foot of <i>Cymbirhynchus macrorhynchus</i> .....	382
Syrinx of <i>Eurylæmus ochromelas</i> .....	384
Syrinx of <i>Cymbirhynchus</i> .....	385
Palate of <i>Philepitta castanea</i> .....	388
Syrinx of <i>Philepitta</i> .....	389
<i>Apus dukianus</i> .....	392
Skull of <i>Bassaricyon alleni</i> .....	398
Upper jaw of <i>Bassaricyon alleni</i> .....	398
Lower jaw of <i>Bassaricyon alleni</i> .....	399
First upper tooth of <i>Ursus japonicus</i> and <i>U. americanus</i> .....	442
Head of <i>Natalus microtus</i> .....	444
Head of <i>Lemur macaco</i> .....	451
Head of <i>Lemur nigerrimus</i> .....	451
Bones of fore limb of <i>Antechinomys</i> and <i>Antechinus</i> .....	457
Bones of hind limb of <i>Antechinomys</i> and <i>Antechinus</i> .....	457
Stomachs of <i>Antechinomys</i> and <i>Antechinus</i> .....	458
Liver of <i>Antechinomys</i> .....	459
Right foot of <i>Leptosoma</i> .....	466
Wing-muscles of <i>Leptosoma</i> .....	470
Deep plantar tendons in <i>Leptosoma</i> .....	472
Syrinx of <i>Leptosoma</i> .....	473
Head of Prongbuck, showing the new pair of horns the day after the shedding of the old ones .....	540
Horn of Prongbuck, drawn the day after the shedding of the old horns .....	541
Horn of Prongbuck, one month after the shedding of the old horns ..	542

	Page
Hand of Red Uakari, palmar aspect .....	630
Foot of Red Uakari, plantar aspect .....	631
Liver of Red Uakari, from above .....	636
Liver of Red Uakari, from below .....	637
Part of side walls of skull of a New-world Monkey ( <i>Brachyurus rubicundus</i> ) .....	639
Part of side walls of skull of an Old-world Monkey ( <i>Cercopithecus pyrrhonotus</i> ) .....	639
Brain of Red Uakari, seen from above .....	642
Brain of Red Uakari, right half, seen from below .....	642
Brain of Red Uakari, left half, seen from the outside .....	643
Brain of Red Uakari, seen from the inside .....	643
Map of part of the basin of the Amazons, to show the distribution of the Uakari Monkeys .....	647
Right hind foot of <i>Reithrodon alstoni</i> .....	691
Skull of <i>Reithrodon alstoni</i> .....	692
Front part of skull of <i>Reithrodon typicus</i> .....	694
Cæcum of <i>Reithrodon alstoni</i> .....	695



PROCEEDINGS  
OF THE  
SCIENTIFIC MEETINGS  
OF THE  
ZOOLOGICAL SOCIETY  
OF LONDON  
FOR THE YEAR  
1880.

(PLATES.)

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# LIST OF PLATES.

1880.

Plate		Page
I.	<i>Myiophoneus castaneus</i> .....	13
II.	<i>Chrysotis erythrura</i> .....	23
III.	<i>Tyrannus niveigularis</i> .....	28
IV.	<i>Palæolampas crassa</i> .....	43
V.	<i>Arvicola guentheri</i> .....	50
VI.	<i>Megalurus interscapularis</i> .....	
VII.	Fig. 1. <i>Pæcilodryas æthiops</i> . Fig. 2. <i>Munia melena</i> }	65
VIII.	<i>Rallus insignis</i> .....	
IX.	Fig. 1. <i>Chrysotis cæligena</i> . Fig. 2. <i>C. dufresniana</i> ..	68
X.	<i>Icticyon venaticus</i> .....	70
XI.	} New species of Tineidæ .....	77
XII.		
XIII.	} Land-Shells from Menton .....	94
XIV.		
XV.	New Indian Butterflies.....	147
XVI.	<i>Ptilochloris buckleyi</i> , ad. et pull. ....	155
XVII.	<i>Grallaria dignissima</i> .....	
XVIII.	New Phytophagous Coleoptera .....	166
XIX.	East-African Rhopalocera .....	182
XX.	<i>Turdus maranonicus</i> .....	189
XXI.	<i>Conothraupis speculigera</i> .....	
XXII.	New Shells from Nossi-Bé Island and East Africa ..	215
XXIII.	<i>Ziphius novæ-zealandiæ</i> .....	232
XXIV.	} The Land-Molluscan genera <i>Girasia</i> and <i>Austenia</i> ..	289
XXV.		
XXVI.		
XXVII.		
XXVIII.		
XXIX.	Spiders of the genus <i>Argyrodes</i> .....	320
XXX.	} .....	
XXXI.		
XXXII.		
XXXI.	Shells from Ujiji and Lake Tanganyika .....	344
XXXII.	Anatomy of <i>Spirula</i> .....	352

Plate		Page
XXXIII.	Details of Australian Species of <i>Perga</i> .....	359
XXXIV.	} Australian Species of <i>Perga</i> .....	
XXXV.		
XXXVI.		
XXXVII.		
XXXVIII.	<i>Bassaricyon alleni</i> .....	393
XXXIX.	Lepidoptera from Candahar.....	403
XL.	New Shells from Port Darwin and South Australia	415, 418
XLI.	Tests of Temnopleuridæ .....	422
XLII.	Fig. A. <i>Neirottrichus gibbsii</i> } Fig. B. <i>Urottrichus talpoides</i> }	440
XLIII.	<i>Uromastix princeps</i> .....	445
XLIV.	<i>Tragelaphus gratus</i> .....	452
XLV.	<i>Antechinomys laniger</i> .....	454
XLVI.	<i>Megaderma gigas</i> .....	461
XLVII.	Fig. 1. <i>Vidua splendens</i> } Fig. 2. <i>Pytelia wieneri</i> }	475
XLVIII.	New Species of Shells from various Localities .....	478
XLIX.	<i>Anolis buckleyi</i> .....	491
L.	<i>Bufo viridis</i> .....	545
LI.	<i>Bufo mauritanicus</i> .....	
LII.	<i>Bufo regularis</i> .....	
LIII.	Species of <i>Myodora</i> .....	578
LIV.	New Phytophagous Coleoptera.....	588
LV.	New Phytophagous Coleoptera .....	
LVI.	New Butterflies from New Guinea .....	609
LVII.	New African Shells .....	614
LVIII.	<i>Dryotriorchis spectabilis</i> .....	621
LIX.	<i>Laniarius atrocroceus</i> .....	623
LX.	Fig. 1. <i>Fminia lepida</i> . Fig. 2. <i>Drymocichla incana</i> ..	624
LXI.	<i>Brachyurus rubicundus</i> .....	627
LXII.	Head of <i>Brachyurus rubicundus</i> .....	
LXIII.	<i>Brachyurus melanocephalus</i> .....	
LXIV.	Anatomy of <i>Ferussacia gronoviana</i> .....	662

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January 6, 1880.

Prof. Flower, LL.D., F.R.S., President, in the Chair.

Prof. Newton, M.A., F.R.S., V.-P., drew the attention of the meeting to a specimen of *Chatura caudacuta* (the "Needle-tailed Swallow" of Latham, Synops. Suppl. ii. p. 259), which had been intrusted to him for exhibition by Mr. G. B. Corbin, of Ringwood, near which place it had been shot on the 26th or 27th of July last. About the middle of that month Mr. Corbin saw one evening two strange birds flying over the river Avon in company with Swifts, and in the course of the following week had better opportunities of observing at least one of them. A few days after Mr. Corbin held in his hand the bird now exhibited, which had been shot in the meantime, and was, he had no doubt, one of those he had previously watched. Prof. Newton stated that this example was the second of the species known to have been obtained in this country—the first having been shot in July 1846, near Colchester (Zool. p. 1492), and examined, before it was skinned, by the late Mr. Yarrell and other naturalists of authority. The species was described by Latham from a specimen procured in New South Wales; and for a long time Australia was thought to be its *habitat*. By degrees ornithologists learned that it was only a regular visitant to that country from its real home in Eastern Siberia, where it was first discovered by Steller, while Pallas, not knowing it was identical with Latham's *Hirundo caudacuta*, redescribed it (Zoogr. R.-As. i. p. 541) under the name of *H. ciris*. It has since been recorded from Nepaul, Sikkim, and

PROC. ZOOL. Soc.—1880, No. I. 1

Bhotan, and is said to breed in the Himalayas; but the examples which have reached England have most likely made their way hither from Siberia. It is no Swallow, but a Swift, belonging to the genus of *Cypselidæ*, to which, in 1826, the name *Acanthylis* (properly *Acanthyllis*) was applied by Boie, and *Chaetura* by Stephens—a genus which differs from *Cypselus* in the structure of its foot and in the spine-like tips of its rectrices.

---

Dr. Mulvany, R.N., exhibited a specimen of a Penguin of the genus *Eudyptes*, and read some remarks on it which tended, in his opinion, to show that a moulting of the horny sheath of the beak took place in this species.

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The following papers were read :—

1. Preliminary Notes on Individual Variation in *Equus asinus*.  
By JOHN HENRY STEEL, M.R.C.V.S., F.Z.S., Demonstrator of Anatomy at the Royal Veterinary College.

[Received December 8, 1879.]

The remarkable uniformity in external characteristics which ages of neglect and degradation have conferred upon the Ass of this country contrasts so forcibly with the amount of variation presented by certain of our domesticated animals that some have based upon it conclusions of a general nature tending to the admission of essential differences between the effects of natural selection and those resulting from artificial influences. For proof that these views are untenable we need simply refer to the fact that on the Continent, in the East, and even through quite recent artificial selection in America external variation in the Ass is very marked. With regard to modification of internal structures, we believe the following are worthy of note as the outcome of the large number of dissections made by ourselves and by students under our supervision. We were hardly prepared to observe so much variation, and were struck by many Ruminant affinities of *Equus asinus*. Our observations are not arranged in a statistical form; nor have we occupied our time with minute variations in bulk, length, and capacity; we have selected those characters which are most striking and at the same time most instructive.

#### OSTEOLOGY.

*Vertebra, Cervical.*—*Atlas* and *Dentata*: imperfect condition of foramina for spinal nerves, due to arrested development.

*Seventh vertebra, Prominens*: vertebral foramen may occur in one or both transverse processes.

Transverse process with costiform prolongation. This condition is remarkable as showing a tendency to increase in the number of the ribs. The process is invariably autogenous, and not unfrequently sends a styloid prolongation downwards in the adult; but this is

generally short, although we have seen it long and connected with the first rib below the upper head of scalenus by an elastic band; and in a specimen now before us the transverse processes are asymmetrical, several inches in length, prolonged by well-marked elastic bands to cartilaginous nodules appended to the prosternum in front of the first sterno-costal articulations.

*Dorsal and Lumbar.*—The dorsal intervertebral gaps are sometimes truly intervertebral; often each is wholly pierced through the pedicle of one vertebra. The degree of separation of the costo-transverse articulation from that for the head of the rib varies much in the posterior dorsal vertebræ of different individuals. The last ribs also vary much in length, size, and degree of curvature. The presence of a so-called “floating rib,” making the series nineteen in number, is frequently observable. This “floating rib” is generally present only on one side. It is not a vertebral rib, but a sternal rib; for it is appended to the extremity of one or two lumbar transverse processes, the homotypes of the vertebral costæ of the dorsal region. Often, when not represented by bone, it occurs as a portion of cartilage or a band of white fibrous tissue, embedded in the abdominal muscles in such a manner as to remind us of the homotypical concordance of the intercostals and the abdominal muscles.

In the *sacral region* it is often difficult to define the extent of the “false sacrum” backwards; for coccygeal vertebræ become appended by ankylosis, increasing apparently the ordinary number of five sacral bones. The last lumbar, too, sometimes assists in the support of os innominatum; and in other respects the “true sacral bones” are not always the same.

*Coccygeal.*—Vary in number, especially with age.

The peculiar modifications which we have noted in the seventh cervical, the uncertainty observable in the anterior and posterior parts of the lumbar and sacral regions, and the variation in the number of ribs prominently bring to our mind the question “How is the vertebral column becoming modified in the present day?” and also, “Will an examination of these points throw any light on the remarkable preponderance of dorso-lumbar vertebræ and costæ in *Perissodactyla ungulata*?”

*Skull.*—Exhibits many minor variations, most of them probably sexual or due to age.

*Limbs, Fore.*—*Scapula*: differences in figure, thickness etc. Often, instead of the gradual disappearance of the spine inferiorly, it terminates in a slightly prolonged process, a rudimentary acromion similar to that seen in the Ox, but smaller. Medullary foramen varies in position; also glenoid cavity rounded or oval.

*Humerus*: synovial fossæ vary in size and form, as do those in upper part of *radius* and *ulna*. The *ulna* generally extends downwards only two-thirds of the length of the radius; but in the foetus it is much longer in proportion, and in the adult we occasionally find it passing downwards to the supero-external part of the knee to articulate with os cuneiforme. If we examine the inferior extremity of the radius of the foetal colt, we may note that at its external part is

a small ossific centre. Our cases of variation show us that we must describe this as *the inferior extremity of the ulna*. The value of this observation as illustrating the similarity of the forearm of the Ass to that of the Ox is evident.

*Carpus: os trapezium v. pisiforme* generally present, but sometimes absent.

*Metacarpus* and *Phalanges*: major variations do not come under our notice (in the Ass).

*Hind.—Os innominatum*: form, size, and relations of auricular facet of ilium vary.

*Fibula* varies similarly to ulna in fore limb. Often extends to tarsus, occupying whole length of outer part of tibia. In other cases, and generally, consists superiorly of a small button-shaped appendage externally placed to upper part of tibia, tapering to a point inferiorly, from which a white fibrous band extends downwards, becoming continuous with the inferior extremity of the tibia, the external part of which is developed from a distinct ossific centre, the representative of the tarsal fibula of Ruminants.

*Tibia* and *astragalus*: synovial fossettes vary in development.

*Smaller tarsal bones* very frequently united by ankylosis into a single mass, without any external indication of disease. This is the condition known to veterinary surgeons as "occult spavin." We are not yet prepared to attribute to it any morphological importance.

*Cuneiforme parvum* composed of one or of two portions.

#### SPLANCHNOSKELETON.

Ossification or calcification of the posterior portion of the sclerotic occurs in old Asses.

*Os hyoides* presents between cerato- and stylo-hyal on each side a bony nodule representing the epihyals, which are well developed in the Ox.

An *os cordis* has been observed in the Ass; it is always present in the Ox.

#### MYOLOGY.

*Head.*—We generally observe muscular fibres which run from the antero-external angle of orbicularis palpebrans beneath zygomaticus to the outer surface of buccinator. These represent *lacrimalis* of the Ox, and are seldom seen in the Horse. They are deficient in some Asses.

*Retractor labii superioris* sometimes has a supplementary portion which runs from the common point of origin of the muscle to the tendon of the nasalis longus labii superioris, which it draws downwards, and also to spread out by some of its fibres over the superior part of the "false nostril."

The "false nostril," the peculiar nasal pouch of Equidæ, undergoes considerable variation at its extremity, sometimes presenting a slight tendency to bifidity of its cul-de-sac. In the Ass it is seldom used; for the animals are never driven to such extremes of rapid progression as the horse. Hence we often find these sacs distended with

masses of laminæ of epithelial débris. The *dilatatores naris* vary in their arrangement in relation to this pouch; thus, ordinarily a continuous series of fibres extends to it from above, behind, and below, being the superior and inferior dilators. But we have seen excessive development of the band against the cul-de-sac of the pouch and deficiency of the other parts of the series. The posterior extremity of *retractor labii superioris* has sometimes a muscular addendum connecting it with the zygomatic ridge.

*Mylohyoideus* varies somewhat in being divided generally at its anterior part into two distinct planes.

*Geniohyoideus* sometimes sends a small distinct band to genioglossus at about the centre of the intermaxillary space.

*Hyopharyngeus*, in addition to its usual attachment to the inferior part of internal surface of superior third of stylohyal, has often another one, quite distinct from the inferior third. We more frequently see the latter in the Horse.

*Hyoideus parvus* sometimes absent.

*Hyoglossus brevis* sometimes attached to stylohyoid, generally not.

*Arytænopharyngeus* is occasionally well marked.

*Retractor oculi* may form a complete investment of the optic nerve, or consist of four bands corresponding with the recti.

The *middle oblique muscle* of the eye, as described by Strangeways, occasionally occurs in the Ass.

The inferior opening of the lachrymal ductus ad nasum varies in position; generally it opens at the upper part of the anterior naris, thus differing remarkably from the same structure in the Horse.

*Neck.*—*Levator humeri* never shows the fibrous band indicative of the seat of the clavicle, which this muscle has in the Ox, Pig, and other Ungulates; but this information is conveyed in some subjects, in which we have seen a small muscle running from levator humeri around the anterior part of pectoralis anticus to the inner side of that muscle, where it disappears.

*Serratus magnus* has sometimes a distinct rudimentary division passing to second cervical transverse process, generally only extends as far forwards as the third (see arrangement in Ox).

*Scalenus*: instead of terminating by each head at the first rib as in the Horse, the superior division may be prolonged to the third rib or even further back (see arrangement in Ox) over serratus magnus.

*Longus colli* we have seen attached only beneath the five anterior instead of the six anterior dorsal vertebræ.

*Back.*—*Transversalis costarum* posteriorly in some cases is large and muscular and blended with longissimus dorsi in the lumbar region; in others it is tendinous and inserted into first lumbar transverse process.

*Serratus posticus minor* varies considerably in its development and attachments.

*Latissimus dorsi* just before its insertion into the humerus varies in its relations with scapulo-ulnaris. Sometimes serial muscular

bands beneath the arches of the ribs run from one rib to another, crossing two or three; these *subcostales* vary in number, are sometimes continuous posteriorly with the *psoæ*, and are covered by the *pleuro-costalis*,

*Transversalis abdominis* varies in the degree of extension of its tendon towards the internal abdominal ring. The *rectus abdominis* has a variable number of transverse tendinous markings.

#### LIMBS.

*Hind.*—*Sartorius* superiorly is attached to the tendon of *psoas parvus*, to the os innominatum with *psoas parvus*, or only to the lumbar fascia, sometimes to two or even three of these points.

*Flexor pedis perforans* sometimes presents a distinct muscular belly and tendon, probably a representative of the *flexor longus hallucis* found in man.

Variations of pedal muscles less marked than in fore limb.

*Fore.*—*Scapulo-humeralis posticus* sometimes almost obsolete.

*Teres externus* sometimes divisible into *teres proper* and *acromio-humeralis*, as in Ox.

*Flexor brachii.*—Superior tendon has a remarkable piece of red muscular structure on its anterior part, which varies considerably in size. Also the band which runs from this muscle to *extensor metacarpi magnus* may often be separated nearly to the knee; careful dissection shows that the inferior extremity of this muscle is somewhat divided into two parts similar to those seen in Dog &c.

*Pronator teres* is of frequent occurrence inside the elbow-joint, arising from the internal inferior prominence of humerus, inserted just below internal lateral ligament, crosses radial artery, vein, and nerve. Generally this muscle is represented only by a small white fibrous band.

*Extensor pedis.*—Thiernes's and Phillip's muscles sometimes distinct, often imperceptible.

*Lumbrici* vary in number and size. The *interossei* of the large metacarpal, which in the Equidæ form the superior sesamoidal ligament, vary in their amount of muscular structure and in their bulk.

#### NEUROLOGY.

Nerves remarkably uniform; sometimes the transverse metacarpal branch is not immediately subcutaneous, but separated from the skin by a longitudinal band of fibrous tissue.

#### SPLANCHNOLOGY.

Sometimes a third rudimentary circumvallate papilla a little behind the two usually present. Position of parotid opening varies to a slight degree.

*Teeth.*—*Incisors*: sometimes only four present in each series, corner permanent incisors having never appeared. Occasionally the upper incisor series has quite become lost—either a result of wear or fracture. The superficial resemblances of this condition to that which occurs in the Ox is, of course, of no morphological value.



*Canines* long or short, sexual variation.

*Premolars*: small "Wolves' teeth" occasionally present in front of four anterior molars.

*Stomach* often presents a very marked central transverse constriction where cuticular mucous joins the villous.

*Cæcum* sometimes retains the form it presents in eight months' fœtus; its apex sometimes very elongated and pointed.

*Colon*.—Longitudinal muscular bands vary in size and in number at different parts of the bowel.

*Liver*.—Lobes vary in form and much in size. Ligaments differ in degree of development, especially falciform ligament, which sometimes runs as far backwards as umbilicus, containing a pervious vein in its thin free margin.

*Parovarium*.—On outer surface of broad uterine ligament, sometimes large, often obsolete.

*Male mammae* often extremely large.

*Thyroid body* varies much in form, especially in the size of the band connecting its lateral masses. *Conchial cartilages* prolonged downwards by small rounded band to lateral part of guttural pouch and to posterior angle of stylohyal. A remarkable peritoneal band sometimes runs from the cæcum to the omentum major, reminding us of a condition we have noted in one form of *Macacus*.

#### ANGIOLOGY.

*Anterior aorta* often entirely absent. Sometimes a large anterior mediastinal branch passes downwards from this vessel. The dorsal and posterior cervical vary in their relations to each other. Generally these vessels are united on the right side and distinct on the left; but this condition may be reversed. The cervical may become united by a well developed subcostal with the sixth costal as given off from the posterior aorta; but this is not constant. The vertebral passes through or below the seventh cervical transverse process. The submaxillary may arise directly from the carotid instead of from the external carotid. External pectoral arises from internal pectoral, or axillary.

*Posterior aorta*.—Bronchial and œsophageal often arise by common root, or are distinct. Renal may supply suprarenal capsules and kidney; or the former may be supplied directly by a branch from the posterior aorta. *Spermaties*—one sometimes considerably more anteriorly placed than the other, even given off by posterior mesenteric. Between internal iliacs occasionally a small middle sacral arises. The obturator, epigastric, and inguinal sometimes arise from external iliac. The origins of the profunda and of the artery of the cord often vary.

The medullary artery of the femur is sometimes given off through the foramen at the anterior part of the bone instead of at the internal surface of the bone. The artery of the humerus is similarly variable. The circumflex of the toe is variously formed in different cases.

Thus from these examples we see the arteries are the most fre-

quent subjects of variation. The veins also are not regular. These differences are as numerous and as marked as those in man.

Our observations point to important affinities, and, we have reason to believe, may direct attention to conclusions by no means as yet generally received. So we are in hopes that we have not overestimated the importance of our subject. Investigation of varietal modification of domesticated animals should teach us the general laws and methods of modification, and thus bear fruit in advancement of the science of anthropology, in promoting the scientific management of our animal servants, and in rendering our knowledge more exact with regard to those forms which inhabited the earth in bygone ages.

## 2. Notes on *Chlamydophorus truncatus*.

By E. W. WHITE, F.Z.S. Lond., and F.Z.S. Reip. Arg.

[Received Dec. 9, 1879.]

During my recent travels through the western provinces of the Argentine Republic, this beautiful little plantigrade aberrant member of the Armadillo family enticed me, in the month of August 1879, to undertake a ride of forty leagues from Mendoza and a diligent search for six days in company with a large number of men, in order to obtain a better knowledge of its habits.

The range of *Chlamydophorus truncatus* extends in latitude from the valley of Sonda, province of San Juan,  $31^{\circ}$  S. lat., down to San Rafael, seventy leagues S. of Mendoza,  $34^{\circ}$  S. lat., and in longitude from San Luis to the Andes. In the same neighbourhood are found three species of true Dasypodidæ.

I was fortunate enough to secure one living specimen of the *Chlamydophorus*, which, in spite of the utmost attention, survived capture only three days; in fact, no instance has occurred of a longer survival than eight days in captivity.

The usual drawings of this animal in zoological works are erroneous in more than one particular; for instance:—

( $\alpha$ ) The tail is represented as flexible and terminating in a somewhat flattened though, on the whole, solid pointed paddle—whereas it is almost perfectly inflexible, the paddle at the extremity being completely flattened and rounded at the vertex.

( $\beta$ ) The fringe attached to the inferior edge of the scute is depicted as continuous, and drooping from the outer margin of one eye completely round to the outer margin of the other: the fact is, whilst the silky fringe from the lateral surface of the scute is drooping and inclined towards the tail, that issuing from the ultimate enlarged ring of the dorsal carapace, uniting with that from the exterior ring of the truncated extremity, forms a double somewhat bristly fringe standing out pretty well at right angles to that truncated extremity.

(γ) The lateral edges of the dorsal chitinous shield are represented as though forming a continuous wave-line, whereas these lateral edges are sharply serrated.

(δ) In some drawings the body is figured as almost nude, or at most covered only with scanty short hair; the truth is, the body is covered throughout, even down to the extremities of the humerus and femur, and beneath the dermo-skeleton to the dorsal ridge, with a thick silky downy mantle.

(ε) In all drawings that have come under my observation the eye is delineated as distinctly visible—whereas, in nature it is rudimentary, besides being completely covered by the intermingling of the fringe and mantle.

(ζ) In all published representations there is a general deficiency of apparent solidity and roundness towards the truncated portion; the body is too much flattened. The fact is, the basal rings of the dorsal coat-of-mail increase in circumference until they coincide with the outer edge of the truncated extremity, the sections gradually rising from an elliptic to a circular form; further, the projection of this slightly convex truncated extremity is very exactly a sector of a circle, the centre of which is in the point whence issues the tail, the whole of this truncated armour-plate forming a very hard, solid, bone-like structure, which at once suggests the use to which, in my opinion, it is devoted, viz. to act as a rammer to consolidate the sand and fill up the entrance to its burrow from the inside and thus prevent the ingress of its enemies.

(η) The nature of the ground frequented is generally represented as rocky; now a *Chlamydochorus* on a rocky eminence is an anomaly, as it is only found on and in médanos (sand-dunes), or in their proximity, the characteristic vegetation of which is low thorny brushwood and cacti.

When walking, the *Chlamydochorus* plants both the fore and hind feet on the soles, and not on the contracted claws, as is the case with the Ant-eater, carrying its inflexible tail, which it has no power to raise, trailing along the ground and much inclined downwards from the body. As it commences to excavate, the fore feet are first employed; and immediately afterwards, supporting its body on the tripod formed of these and of the extremity of the tail, both hind feet are set to work simultaneously, discharging the sand with incredible swiftness.

The burrows, which are never left open, usually have but slight, if any, inclination to the horizon.

Although analogy and form would seem to indicate it, I never could detect the tail aiding in the operation of excavation; in fact, its inflexibility precludes this idea: the only use of the flattened extremity appears to me to be, to furnish it with a more secure point of support in the shifting sand.

Sluggish in all its movements except as a fodient, in which capacity it perhaps excels all other burrowing animals, the *Chlamydochorus* performs the operation of excavation with such celerity that a man

has scarcely time to dismount from his horse before the creature has buried itself to the depth of its own body. With regard to its movements within the burrow, these, as well as the structure of the tunnel, seem to me to be governed by the general timidity of its character. The tunnel is scooped out of the exact size of the truncated extremity, so that whenever the animal feels inclined to quit its subterranean dwelling, this must be accomplished in one of three ways—either ( $\alpha$ ) by a retrograde motion, using the ram to burst through a consolidated wall of sand, or ( $\beta$ ) by turning its body round and emerging from the entry head first, or ( $\gamma$ ) by tunnelling in advance and emerging from a different hole. The third, in my opinion, is the course followed by the *Chlamydophorus*; for, although when put into a box, under suitable conditions, I observed that by first inclining itself on one side, bringing the snout into close proximity to the body and directed towards the tail, with a screw-like motion the animal was able to wriggle itself round and effect a complete turn, notwithstanding that at first sight the rigid tail would appear to be fatal to such a movement; yet such a procedure is unnatural, and must be productive of inconvenience, and would, of course, be altogether impossible were it not that the dorsal scute, which is only attached longitudinally along the dorsal ridge, is extremely flexible—so much so, indeed, that it can be easily bent slightly upwards on the merest pressure from the fingers; a further illustration of this great flexibility is furnished by the fact that when laid on its back, the animal quickly recovers itself.

The only sound I heard it utter was that of distinctly sniffing like a dog; and this it always does when in search of a spot for excavating.

So extremely sensitive is this delicate little burrower to cold that my living example, after passing a night in a box of earth covered with flannels, was found the following morning in a very exhausted condition. Wrapped in warm clothing and placed near a fire it soon revived. On taking it into my hand under a Mendocan midday sun it shivered violently; but whether through fear or chill it is impossible to say. Its normal paradise seems to be when the temperature of its residence is such as is produced by sand so hot as almost to scorch the hand; and yet, if cold be unfriendly, no less so is wet; for although its winter is spent beneath the earth, a fall of rain quickly drives it from its retreat. During summer it leaves its burrow at dusk to search for food; and being truly nocturnal, moonlight nights are very favourable for discovering it.

I placed my solitary specimen on the ground, first on brick and then on wooden flooring; but knowing that it could not excavate, it merely walked round in circles—a further evidence that it cannot see, or only very imperfectly at any rate, by daylight; but far different was its behaviour on being transported to the soil, where after a preliminary sniffle or two, indicating keen scent, it set to work immediately to delve at a very rapid pace.

In the specimen I studied, the translucent dermo-skeleton and all the exposed parts were, during life, of a delicate pink tint, the hair

a glistening snow-white and of silky consistency. The use of the fringe surrounding the shield is, in my opinion, solely to prevent the introduction of sand beneath it during excavation.

The light fine sand in which the *Chlamyphorus truncatus* burrows proclaims unmistakably its presence, as well as that of even the minutest animals, by the tracks left; the fox, the beetle and the spider are thus equally betrayed. The natives are apt observers of these, and even from the saddle will decipher and distinguish at a glance the various foot-prints, and unerringly detail the animals that have passed any assigned spot during the night. With regard to our elegant little friend there is no mistake; besides the impressions of the four feet, the inclined stiff tail leaves its deep central indented line. Of course, after rain, which falls but seldom, the track is accentuated; and the only sure way of effecting a capture is to follow it, as it leads directly to a small hillock of sand, by removing which, the entrance to the tunnel is exposed to view; and if the tracks were numerous, the animal would no longer be rare; but it is a fact that a year or more sometimes elapses without any trace of its existence. In a few instances specimens have been unhoused by the plough.

I could not succeed in discovering the nature of the food from the solitary live specimens I obtained; but I fed it on milk, which it lapped like a cat. I then endeavoured unsuccessfully to entice it with chopped meat, and only by artifice introduced some pieces into its mouth, which it swallowed.

There are authentic cases of the *Chlamyphorus* being preyed upon by other animals, especially by Foxes and Cats.

### 3. Description of a new Species of *Mus* from the Fiji Islands.

By OLDFIELD THOMAS, F.Z.S. Assistant in the Zoological Department, British Museum.

The subject of this description was obtained in October 1878, near the village of Waitovu in the island of Ovalau, by Baron A. von Hügel, who resided for some years in the Fiji Islands, and who has presented his small collection of Fijian Mammalia to the British Museum. This collection consists of specimens of *Pteropus samoensis*, Peale, *Notopteris macdonaldi*, Gray, *Emballonura semicaudata*, Peale, *Mus decumanus*, Pall., *Mus exulans*, Peale, and the specimen here described.

The most noticeable point about this species is the character of the fur, which is extremely long, soft, and silky. The only other Rodent at all resembling it in this respect is the *Hesperomys panamensis* of Gray<sup>1</sup>, which has a similar character of the fur, though in a lesser degree.

<sup>1</sup> *Neomys panamensis*, Gray, Ann. Mag. Nat. Hist. 1873, xii. p. 417.

The muzzle is distinctly grooved from between the nostrils to the upper lip. The ear is rounded, nearly as broad as long, and is covered on both sides with short silvery hairs, which form a very narrow fringe round the edge. The dorsal surfaces of the feet are also covered with similar, but longer, hairs.

The length of the tail is rather less than that of the head and body combined; and it is sparsely covered with short brown hairs, not hiding the scales.

The palm-pads of the hind feet are six in number, arranged as shown as in the accompanying drawing. The fore feet are too much dried up in the type specimen for the shape of their pads to be distinguishable.

The colour of the fur all over the body is of a light slate-colour for seven eighths of its length. The terminal eighth is brown along the centre of the back, becoming lighter towards the sides. On the



Right pes of *Mus huegeli*, enlarged.

belly the tips are quite white, and there is also a white ring round the hairs at about halfway from the roots. The head is coloured like the body.

The skull is that of a typical *Mus*, and presents no characters worthy of special remark. In the type specimen the posterior molars both above and below have not quite grown up into their places; so that it is not fully adult.

Measurements, in inches and tenths:—

Length of the head and body .....	5·0
"    "    tail .....	4·3
"    "    fore foot, without claws .....	0·45
"    "    hind foot    "    " .....	1·1
Ear .....	0·5 × 0·45
Skull <sup>1</sup> , from hinder edge of parietals to end of nasals .....	1·1
Nasal bones, length .....	0·44
Breadth of brain-case .....	0·63
"    between orbits .....	0·23
Length of palate, from behind incisors .....	0·6
"    lower jaw, from condyles to anterior end of symphysis .....	0·73

The only other indigenous Fijian Mice hitherto described are the

<sup>1</sup> The occipital portion of the skull and the zygomata have been unfortunately broken away; so that the full length and breadth cannot be given.

*Mus exulans* and *Mus vitiensis* of Peale<sup>1</sup>:—the former about six inches long, with hair like a Norway Rat; the latter a house-mouse, about three inches long.

I propose to name this species *Mus huegeli*, after its discoverer, who informs me that it does not frequent the houses of the natives, but is found in long grass among rocks and sand in the mountains. It is very probably the Rat which Mr. H. N. Moseley in his 'Notes by a Naturalist on the 'Challenger,'' mentions (p. 308) as having been chased unsuccessfully among the undergrowth on the mountains, when his party were at Levuka, Ovalau, in 1874.

4. Contributions to the Ornithology of Sumatra.—Report on a Collection from the neighbourhood of Padang. By R. G. WARDLAW RAMSAY, F.Z.S., 67th Regiment.

[Received December 30, 1879.]

(Plate I.)

On the 9th August, 1878, Mr. Carl Bock, a Swedish naturalist, arrived at Padang, on the west coast of Sumatra, with the intention of penetrating into the mountains of the interior to investigate their fauna for the late Marquis of Tweeddale, who had secured his services for that purpose. Mr. Bock (*in epist.*) says that he was considerably delayed by having to go to Batavia, in order to obtain passports from the Governor-General of the Netherlands, India, and a permit to import his guns and ammunition into Sumatra.

Losing as little time as possible, Mr. Bock started towards the mountains, and spent three days at Ayer-mantior with Dr. Beccari<sup>2</sup>, who had been collecting for several months in the neighbourhood; he then proceeded *vid* Tamar-datar and Boca to Mount Sago, which is about seventy miles to the north-east of Padang. The summit of Mount Sago is described as being about 8000 feet above the sea-level, and clad with virgin forest; but the highest point reached by Mr. Bock was 5000 feet. He collected in three weeks about one hundred specimens, although the weather was wet and unfavourable. The bad weather having rendered a longer stay on this mountain unadvisable, he moved southward to Sidjoendjoeng, where, after collecting for some time, he proceeded by a tedious route to Paio in heavy rain. In this locality Mr. Bock collected for about a month, and then, towards the close of the year, again moved southwards a distance of about 100 miles to Mocara-labo and Ayer-angat, near the frontier of Korintzi territory.

At Ayer-angat he was much disappointed at the scarcity of birds,

<sup>1</sup> U.S. Explor. Exped. viii. pp. 47-49, 1848.

<sup>2</sup> The results of Dr. Beccari's labours have been laid before the public in a paper by Count T. Salvadori, Ann. Mus. Civ. Gen. 1879, pp. 169-253.

having heard so good a report from the natives; but nevertheless he obtained several species which had not been previously procured by him. He was encamped in the midst of a virgin forest, where, as he describes it, no human being was living. Here all his servants got fever, and then he himself was seized; and so he was obliged to strike his camp and retire to a place called Lolo, at 3500 feet. This latter place he made his headquarters for the remainder of his sojourn in the island, and here formed a considerable portion of his collections.

Mr. Bock, in his letters to Lord Tweeddale, much regretted not having provided himself with small shot, as without it he was not able to obtain good specimens of the smaller species. The absence of small birds from the collection is remarkable, the interesting family of the Timeliidæ being, with the exception of the larger genera *Garrulax*, *Trochalopteron*, &c., entirely unrepresented.

As I hope, when sufficient leisure is at my command, to treat the subject more fully, I abstain from publishing at the present time a full list of Mr. Bock's collection, but take the opportunity of making a few remarks upon it, and also of bringing to notice three apparently undescribed species.

The collection forwarded by Mr. Bock was made between the months of August 1878 and January 1879, in the same part of Sumatra as that in which Dr. Beccari was working in the months of June to September in the former year. One of its chief points of interest is that it contains examples of several migratory species, such as *Turdus sibiricus*, Pallas, and *Phylloscopus borealis*, Blasius, which would only occur in the winter season, and would not, therefore, have been met with by Dr. Beccari.

Mr. Bock's collection contains about 800 specimens, which are referable to 166 species. Of these 32 are not included in the lists of the Marquis of Tweeddale (Ibis, 1877, pp. 283-323) or of Count T. Salvadori (Ann. Mus. Civ. Gen. 1879, pp. 169-253); they are as follows:—

1. *Neopus malayensis*, Temm. ex Reinwardt.
- \*2. *Accipiter stevensoni*, Gurney.
- \*3. *Milvus govinda*, Sykes.
4. *Caloramphus hayi*, J. E. Gray.
5. *Anthracoceros malayanus* (Raffles).
6. *Hydrocissa convexa* (Temm.).
7. *Merops philippinus*, Linn.
8. *Cypselus subfurcatus*, Blyth.
9. *Collocalia francica* (Gmelin).
10. *Eurylæmus javanicus*, Horsfield.
- \*11. *Niltava grandis* (Blyth).
- \*12. *Xanthopygia cyanomelæna* (Temm.).
13. *Bhringa remifer* (Temm.).
14. *Phyllornis media*, Bonap. ex Müller MS.
15. *Criniger gutturalis* (Müller).
16. *Ixidia squamata* (Temm.).



17. *Ixidia leucogrammica* (Müller).
- \*18. *Turdus sibiricus*, Pallas.
- \*19. — *obscurus*, Gmelin.
20. *Ianthocincla lugubris* (Müller).
21. *Phylloscopus borealis* (Blasius).
22. *Erythrura prasina* (Sparrm.).
23. *Limonidromus indicus* (Gmelin).
24. *Analcipus cruentus* (Wagler).
25. *Carpophaga ænea* (Linn.).
26. *Euplocamus vieilloti*, G. R. Gray.
- \*27. *Turnix pugnax* (Temm.).
28. *Rhynchæa capensis* (Linn.).
29. *Hypotaenidia striata* (Linn.).
30. *Bubulcus coromandus* (Bodd.).
31. *Ardetta cinnamomea* (Gmel.).
32. *Dendrocygna arcuata* (Horsf.).

Out of this list seven species, to the names of which an asterisk is prefixed, have, as far as I know, not been before recorded as occurring in Sumatra. In addition to the above-named species are three which appear to be new, viz. :—

*DICRURUS SUMATRANUS*, sp. n.

This species seems to find its nearest ally in *Dicrurus bimaensis*, Wallace<sup>1</sup>, from Lombock, Sumbawa, and Flores. It, however, differs in having the plumage of the back pure black, without any metallic gloss. It also resembles that species in the form of the feathers springing from the base of the maxilla and covering the nostrils; but in the present bird these feathers are much lengthened, reaching over nearly two thirds of the length of the bill. The rectal bristles are also much exaggerated, projecting nearly as far as the point of the bill. The Sumatran bird is also larger than *D. bimaensis*, having a wing of 5·9 inches length against 5·5 in British-Museum examples of the latter species (Wallace gives 5·25, *l. c.*). The tail is nearly square, one specimen only exhibiting a slight tendency in the outer tail-feathers to curl at the tip.

The collection contains ten specimens of this Drongo, collected at Ayer-angat, Paio, and Mount Sago.

Iris vermilion (*Bock*).

*TURDINUS MARMORATUS*, sp. n.

Reddish chocolate-brown, brightest on the flanks and belly, the feathers of the head and back margined with black, giving those parts a scale-like appearance. Beneath, the chin and throat and upper breast white, each feather with a black terminal bar, which becomes wider towards the breast; the lower part of the breast and centre of abdomen as far as the crissum black, with a terminal or subterminal bar of white across each feather; ear-coverts dark

<sup>1</sup> P. Z. S. 1863, p. 492.

rufous-brown, shading into bright chestnut on the hinder part, and widening into a broad patch on either side of the neck.

Length about 7·5 inches, wing 3·6, bill ·95, tarsus 1·25.

One specimen only of this new species is in the collection.

*MYIOPHONEUS CASTANEUS*, sp. n. (Plate I.)

Bright chestnut-brown, except on the head, face, throat, and breast, which are dull purplish blue, and the forehead and lesser wing-coverts bright cobalt.

Mount Sago, 3 September, 1878. Iris grey-blue (*Bock*).

In the British Museum I found an example of this bird, labelled "Malacca," but without a name. The locality is probably erroneous. This specimen differs considerably from mine, both in dimensions and colour, the purplish-blue head being overlaid with a tinge of chestnut, and the lores and forehead being dusky chestnut-brown.

The dimensions of the two specimens are—

	Wing.	Bill fr. gape.	Tail.	Tarsus.
Sumatra ( <i>Bock</i> ) . . . .	5·75	<sup>1</sup>	3·8	1·7
? Malacca ( <i>Mus. Brit.</i> )	5·1	1·32	4	1·7

Of the 24 species described as new by Count Salvadori (*l. c.*), only 8 were obtained by Mr. Bock, viz. :—

<i>Chrysophlegma mystacalis.</i>	<i>Pteruthius cameranoi.</i>
<i>Rhipidura atrata.</i>	<i>Myiophoneus dicrorhynchus.</i>
<i>Hemipus intermedius.</i>	<i>Arrenga melanura.</i>
<i>Heterophasia simillima.</i>	<i>Peloperdix rubrirostris.</i>

Two of these I cannot admit as good species—*Hemipus intermedius* and *Pteruthius cameranoi*. The former, of which I have one good specimen, appears to me to be inseparable from examples in the British Museum of *Hemipus picatus* (Sykes), collected at Mahabaleshwar. The latter I have compared with a specimen in the same museum of *P. æralatus*, Tickell, from the Kachyen hills in Western Yunnan, and found to be identical.

Yet another of the species contained in the above list is, I should say, of somewhat doubtful validity. *Rhipidura atrata* is very close to, if not identical with *R. albicollis* (Vieill.) = *R. fusciventris* (Franklin), of India. It differs, no doubt, in the shade of slaty black of its plumage; but I have found specimens in the British Museum of *R. albicollis* which nearly match the Sumatran examples, although I am bound to say not quite. The difference, however, is so very trifling that the Sumatran bird can, I think, be hardly regarded as belonging to a distinct species.

<sup>1</sup> Bill broken.

5. Description of two new Species of Dwarf Antelope  
(*Neotragus*). By Dr. A. GÜNTHER, F.Z.S.

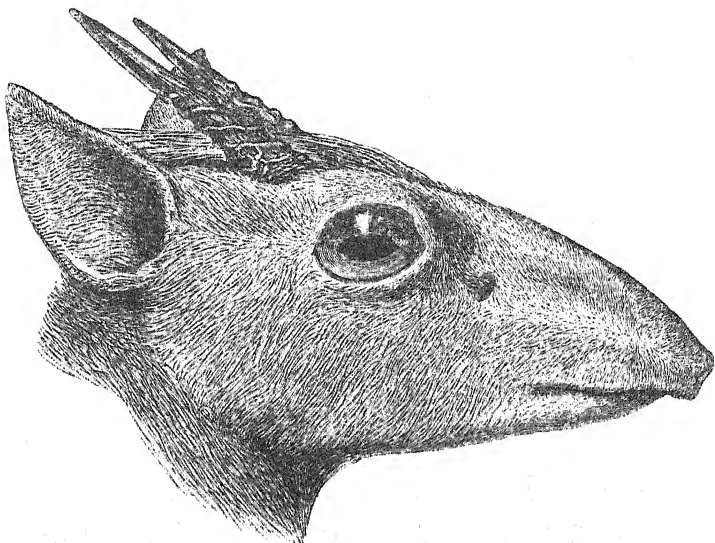
[Received November 21, 1879.]

A Dwarf Antelope obtained by Dr. Kirk near Brava, in the South Somali country, proves to be allied to, and the southern representative of, *Neotragus saltianus* from Abyssinia. Dr. Kirk has sent the skin of a female not quite adult and the head of an adult male; perfect skulls have been extracted from both. I propose for the new species the name of *Neotragus kirkii*.

With regard to size there seems to be no great difference between the two species; but *N. kirkii* is somewhat smaller, and its coloration is very distinct.

In the first place I have to draw attention to the peculiar form of

Fig. 1.



Head of *Neotragus kirkii*.

the muzzle, which is much elongated, protruding beyond the mouth, swollen along its upper profile, and very distensible, resembling in some measure that of the Saiga Antelope. This peculiarity it has most probably in common with the Abyssinian species, though, as far as we can judge from dried skins, it is less developed in this latter; nor do I find it mentioned by any previous writer. I am ignorant of the function in the animal's economy to which it

relates, unless it be the organ by which peculiar sounds are produced, as mentioned by Brehm. It is not peculiar to the male, though more developed in that sex than in the female. The hairs on the crown of the head are prolonged, stiff, pointing backwards to between the ears, forming a flat depressed crest, as in *Neotragus saltianus*.

The colour of the body of the animal is a brownish yellow, finely grizzled with brown—this colour being produced by each hair having two or three broad brown rings, the terminal ring forming sometimes the tip of the hair, sometimes being somewhat remote from it. The grizzly appearance gradually changes into a uniform light reddish-brown, which occupies the whole of the fore and hind legs. The upper part of the throat, the abdomen, and the inner side of the fore legs and thighs are dirty whitish; lower part of the throat tinged with brownish; the long hairs of the head brown, with broad yellowish rings; snout and outer side of the ears brown; a white streak above the eye.

The horns are very similar to those of *Neotragus saltianus*. They are almost parallel, marked by strong, but rather irregular, sub-reticulated annulations, which completely surround the horn; these disappear towards the middle of the length of the horn. The annulated portion is also longitudinally rugose, the terminal third only being smooth.

The following are the measurements of the female:—

	in.
Length of the head .....	4½
„ „ ear .....	2¼
„ „ body and neck .....	13
„ „ fore leg (from the elbow-joint) ..	7½
„ „ hind leg (from the knee) ....	10
„ „ hind foot (from the heel) ..	6½

Measurements of the male:—

Length of the head .....	5½
„ „ ear (shrunk) .....	2¼

I may add that the opening of the lacrymal gland is very distinct, that the tail is very short, apparently composed of a few vertebræ only, and that the spurious claws are as small as in the Abyssinian species.

Any doubts which might have been entertained with regard to the distinctness of this species disappear on comparison of the skulls of the two animals. The lacrymal groove, which in *Neotragus saltianus* is rather shallow, is so much deepened in the Somali species as to receive easily the end of a man's thumb. Secondly, the lateral ramus of the intermaxillary is singularly curved in the shape of an S, very slender, and separated from the lacrymal bone by a broad ascending process of the maxillary, which, therefore, touches the side of the nasal bone (see fig. 2, p. 19). In the Abyssinian species the intermaxillary is straighter and stouter, extending to the lacrymal, with which it forms a suture (see fig. 4, p. 19).

Thirdly, the nasal bones, the shortness of which is characteristic of the genus, are still shorter than in *Neotragus saltianus*; and their posterior margins form an almost straight transverse line, whilst in *Neotragus saltianus* they form an acute angle (see figs. 5 & 6, p. 20).

Fig. 2.

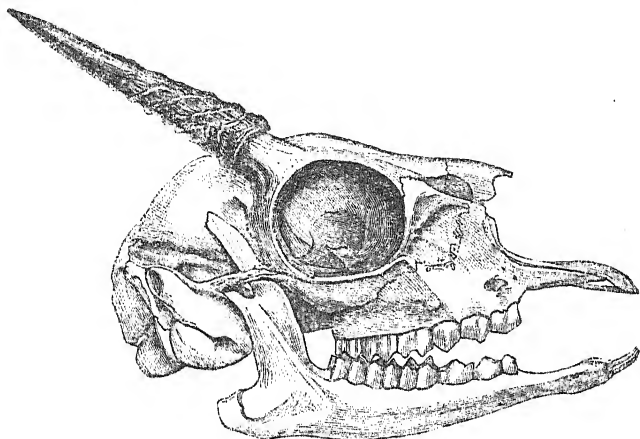
Skull of *Neotragus kirkii*; side view.

Fig. 3.

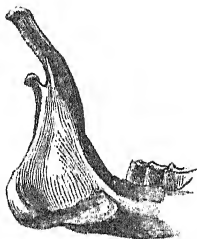
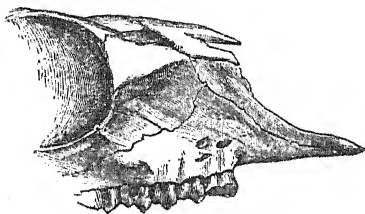


Fig. 4.

Skull of *Neotragus saltianus*.

Fourthly, the infero-posterior angle of the mandible (fig. 2) is produced backwards, forming a projection beyond the hind margin of the mandible; whilst in *Neotragus saltianus* (fig. 3) the hind margin is only slightly excised. It must be remarked, however, that this peculiarity is much less developed in the young female than in the adult male.

Fifthly, the hindmost molar of the lower jaw has a small third lobe developed behind with a single enamel fold, as in the species from Damara Land (see fig. 12, p. 22); this lobe is entirely absent in *N. saltianus* (see fig. 11, p. 22).

The peculiar conformation of the facial bones is clearly in relation to the developed distensible nasal cavity of this animal. The roof of the nasal cavity is supported by cartilage rather than by bone, to admit of greater flexibility; hence the reduction of the nasal

Fig. 5.

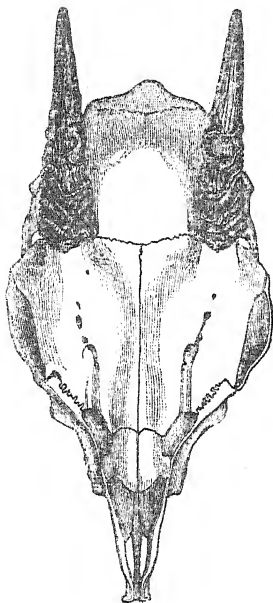
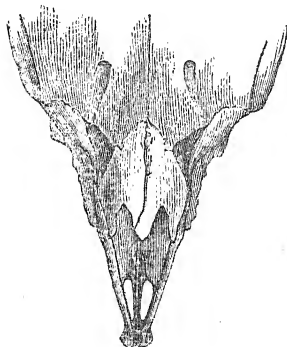


Fig. 6.

Fig. 5. Skull of *Neotragus kirkii*; upper view.Fig. 6. Upper view of facial bone of *Neotragus saltianus*.

bones in *Neotragus* is perfectly analogous to a similar structure in the Saiga Antelope and in the Tapirs.

Since I wrote the preceding remarks Mr. Sclater has kindly placed in my hands a specimen which he had received from Mr. R. Trimen, Curator of the South-African Museum. It had been obtained in Damara Land, and proves to be a third species of this genus, for which I propose the name of *Neotragus damarensis*.

The specimen is the skin of an adult female, from which I have had the skull extracted.

Externally this species resembles so much the Abyssinian *N. saltianus* that it might be taken for a variation of colour. The crest of long cranial hairs is more decidedly black behind than I have seen it in Abyssinian specimens, the majority of the cranial hairs being broadly annulated with black and yellow. The back of the trunk is finely grizzled with black and brownish yellow, the latter colour being replaced behind by grey. The black rings of all

These animals are in good health and in fine condition, and perfectly tame. The female is hornless. The male has apparently lately shed his horns, as the pair which he bears were quite soft when he arrived.

2. Examples of two rare species of Parrots of the genus *Chrysotis*, namely Bodinus's Amazon (*C. bodini*) and the Red-tailed Amazon *C. erythrura*, purchased December 18, 1879.

Both these species are new to the collection.

*Chrysotis bodini* was first described in the Society's Proceedings for 1873 (p. 569, pl. xlix.) by Dr. Finsch, from an example formerly living in the Zoological Gardens of Berlin. In May last year I met with the first example I had ever seen of this species in the Zoological Gardens of Amsterdam (see P. Z. S. 1879, p. 438). Since then I have been fortunate enough to secure a specimen of this Parrot for my collection, which I now exhibit. From the make of this skin, it is probable that its *patria* is the Orinoco district of Venezuela, which is rather singular, as the closely allied *C. festiva* likewise occurs in the same country.

*Chrysotis erythrura* (Plate II.), of which I likewise exhibit an example, was described by Kuhl in 1821, from a specimen in the French national collection, but is so rare that Dr. Finsch was unable to examine an example when preparing his celebrated Monograph. The first examples of it I ever saw were also at Amsterdam last year (see P. Z. S. 1879, p. 438). One of the pair there noticed happening to die, Mr. Westerman kindly sent its skin to me for my own collection.

The exact habitat of this *Chrysotis* is still unknown.

Dr. Günther exhibited the drawing of a fish, *Holacanthus tricolor*, obtained on the coast of the island of Lewes, and communicated to him by the Rev. George Gordon, who examined the specimen whilst in a fresh state. Dr. Günther stated that this was the first instance of this fish (which is common in the West Indies) having reached the British coast.

An extract was read from a letter addressed to the President by Col. Heysham of the Madras Commissariat Staff, giving particulars of two cases of Elephants breeding in captivity in which the period of gestation was observed. The first case was described by Col. Heysham as follows :—

Towards the middle of December 1863, when at Thyetmyo, in Burmah, it was reported to me that three wild Elephants (a male and two females) were doing a great deal of damage near Muadung; and on the 18th of the month, having made all necessary arrangements, I sent some of our Mahouts and Elephants across the river, to try and effect a capture. The following day (the 19th December) I received a report from the Jemadar, that the wild Elephants had joined ours immediately they got near them, and that the male Elephant had covered the four females named in Serjeant Heron's letter. We several times succeeded in fastening ropes

round the male Elephant's legs; but on each occasion he snapped them like so much thread, but did not attempt to leave the place until the 8th January 1864. On that date we got a very stout rope fastened round his hind legs, and although he succeeded in snapping it as he had done the others, he began to think he was in danger, and made off for the jungles. He covered the four females on several occasions between the 18th December 1863 and the day on which he bolted (the 8th January, 1864). The female (Rowell Kutlee) calved on the 3rd of August 1865, which gives nineteen months as the period of gestation.

I very carefully watched these Elephants (knowing them to have been covered), and for the first twelve months saw no such increase of size or alteration of shape as would indicate pregnancy; but in the thirteenth month, 18th January 1865, Serjeant Heron reported to me that two of the Elephants had milk in their breasts, and requested that I would go and see them, as the Mahouts thought they must be going to calve soon. I went and saw the Mahouts draw milk from the two Elephants; and this was the first reason we had to think they were pregnant; but it seems to me to be extraordinary and worthy of remark that the secretion of milk should have commenced so many as seven months prior to calving.

The second case took place at Bellary, in India, and was under the observation of Col. Ostrichsen, when the period of gestation was noted to be the same, viz. nineteen months.

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Mr. H. N. Moseley, F.R.S., exhibited some specimens of sections of Corals received from Dr. G. von Koch of Darmstadt, and prepared by a method devised by him, and made the following remarks concerning them and the results attained by them:—

"There has always been great difficulty in determining under the microscope the exact relation of the various components in the cases of animal structures which are composed partly of hard and partly of soft tissues. We can easily prepare fine sections of the hard structures alone by grinding, and we can also, in all cases where these structures are rendered hard by carbonate of lime, decalcify the tissues with acids, and, thus having removed the hard parts, prepare sections with a razor of the soft tissue alone; but we have not hitherto been able to obtain sections in which both hard and soft structures are preserved together *in situ*. The want of some method which should enable such sections as these latter to be made is most strongly felt by any one who is engaged in the investigation of the anatomy of corals. Corals are so completely penetrated by an extremely hard calcareous skeleton that it has hitherto been impossible to obtain sections in which the exact relation of the soft tissues to the skeleton could be made out. Dr. von Koch, who has devoted himself for some years past to the study of coral-structures, has succeeded in devising a method which, though somewhat laborious and tedious, yields exactly what was desired.

"His method was first described in 1874, in a dissertation on the anatomy of the Organ Coral (*Tubipora hemprichii*), published at



Jena<sup>1</sup>; but it is only lately that he has succeeded in preparing sections of corals so perfect as those exhibited.

"The method is as follows :—The corals with all their soft parts *in situ* having been hardened in absolute alcohol, are placed in a solution of Canada balsam in ether, or in gum-sandarach in alcohol, or, better still, of copal in chloroform. After they have become thoroughly permeated by the resinous solutions, they are taken out and dried slowly until the masses become perfectly hard. The hard masses can now be cut into sections with a fine saw, and then rubbed down in the usual manner on a whetstone. The sections can be stained with carmine after being thus prepared, even without the removal of the resin; but usually the tissues are stained in mass before being placed in the resinous solutions. All the soft parts thus become deeply tinged, and stand out in well-marked relief. The sections can then be mounted in fresh Canada balsam<sup>2</sup>. The sections received from Dr. von Koch certainly show a good deal which could not have been exhibited before; and they are interesting, not only as illustrating a new point in the anatomy of corals, but because the method by which they are prepared seems to me to be likely to yield valuable results in the case of many other questions of microscopic investigation. It will be quite easy, for instance, by this means to prepare microscopic sections of injected bone in which the injected capillaries will be shown in their relations to the Haversian systems. Sections also could thus be prepared of the internal ear in which the hard and soft tissues will be preserved together, and the latter would not have been subjected to the deleterious action of the acids which are usually employed to decalcify the cochlea before it can be sliced with a razor. Sections through the undecalcified arms of starfish or crinoids prepared by this method could not but yield most interesting results, and similarly in the case of those Bryozoa which have a calcareous and opaque skeleton. I have sent specimens of *Millepora* and other hydroid corals to Dr. von Koch, and await with great interest the sections which he has promised to cut from these. It is even possible that by this means instructive sections for museum purposes of whole starfish or other animals might be cut and mounted on glass.

"It has hitherto been supposed that the wall of all Madreporarian coralla is developed within the mesodermal layer of the wall of soft tissue of the animal. If this were the case, it would be expected that a simple layer of mesoderm and ectoderm would be found lying externally to the wall of hard tissue in transverse sections of a complete simple coral. Dr. von Koch, however, in his sections finds that this is not the case, but that there exist externally to the calcareous wall what he believes to be the continuation of the mesenteries, and also a series of cavities which are the continuation of the intermesenterial spaces. He thus comes to the conclusion that the wall of the coral-cup is not developed, as supposed, by calcification of the middle

<sup>1</sup> Anatomie der Orgel-Koralle (*Tubipora hemprichii*). Dissertation zur Erlangung der *venia docendi*. Von Dr. G. von Koch. Jena, 1874.

<sup>2</sup> For a detailed account of Dr. von Koch's process see the 'Zoologischer Anzeiger,' Jahrg. 1, p. 36.

layer of the body-wall of the animal, but that it is a secondary structure formed within the body-cavity by the gradual coalescence of the outer extremities of the calcareous septa. In this conclusion he is supported by the fact that in transverse sections of the coral-wall of many species of corals suture-like lines are to be made out, separating the calcareous tissue composing it into a series of masses which are apparently nothing else than the swollen peripheral portions of the septa themselves.

"Dr. Koch, in a paper on the skeleton of corals, lately published in 'the Morphologisches Jahrbuch'<sup>1</sup>, exhibits his results in three diagrams. The diagrams represent sections of the same coral, a *Caryophyllia*, at various heights, and are believed by the author to exhibit also the process by which the actual development of the hard skeleton or corallum takes place. In the first the septa are seen quite separate from one another and occupying the centres of the intermesenterial spaces. In the second, the septa have coalesced by means of lateral outgrowths, and a complete calcareous wall is formed with the continuations of the mesenteries and intermesenterial spaces beyond it, these being shown much larger than in nature for the sake of clearness. In the third section, taken towards the bottom of the cups, the tissues external to the calcareous wall have perished and disappeared—this perishing of the lower parts of the soft tissues on the outside of the coral's cup at its base as growth proceeds at the summit being a normal process in the case of many corals, but not by any means in all.

"The calcareous parts are covered everywhere, both according to Dr. von Koch's observations and my own and those of other investigators, with a layer of mesodermal tissue, within the substance of which doubtless they are deposited.

"It will be seen that the outer chambers and mesenteries are found by Dr. von Koch to exist only in the upper part of the coral. In his first diagram there is nothing to be seen but what would have been expected: the exsert calcareous septa rise above the wall of the coral-cup; and thence they only are cut across in a superficial section. In order to explain what is seen in the second section, it may possibly not be necessary to assume that the soft tissues in which the calcareous wall is embedded do not belong to the wall of the animal. What seems to be the case is that the intermesenterial cavities lap over a short distance beyond the edge of the coral-cup, and are thus exposed in section beyond it when the entire coral is cut across. The soft tissues of the disk are to be seen in a living expanded *Caryophyllia* rising far above the summit of the corallum. No doubt, in specimens preserved in alcohol, the tissues are drawn down to a certain abnormal extent on the outside of the corallum as well as into its interior by contraction. The soft tissues in which the calcareous wall is developed may perhaps still be regarded as derived from the body-wall, although they do not quite coincide with the outer portion of it towards the summit of full-grown corals. In many simple corals the

<sup>1</sup> "Bemerkungen über das Skelet der Korallen," Morph. Jahrbuch, Bd. v. p. 316.

outer layer of the body-wall persists as a covering all over the outer surface of the fully grown coral. I have decalcified many such, and never found any trace of mesenteries or intermesenterial canals on the inner surface of this layer.

"The question is to a certain extent one of nomenclature. At all events Dr. Koch's results are very interesting; and further research by use of his method in the case of other corals must lead to valuable results.

"With regard to the development of the coral-wall from out-growths of the ends of the septa, it must be noted that Prof. Lacaze-Duthiers found, in the case of the Mediterranean coral *Astroïdes calicularis*, that the wall is developed in the young coral from calcareous spicules quite distinct from those composing the septa. Dr. Koch, however, considers that the mode of development may be quite different in the case of the Perforate Corals, to which group *Astroïdes* belongs, from that occurring in Imperforata. Further, however, many very young corals of the genus *Flabellum* were dredged by H.M.S. 'Challenger.' In these the wall appears as very distinct from the septa, and there can be little doubt that both the horizontal wall at the base and the lateral wall are structures developed apart from the comparatively insignificant septa. In *Flabellum* the sutures in transverse sections of the coral appear to correspond with the centres of the septa themselves, and not with the intervals between them as in *Caryophyllia*; and in the young corallum the wall is seen to be doubled in as it were opposite the lines of attachment of the septa to it.

"Corals are so difficult as subjects of investigation that our knowledge of them is as yet very imperfect indeed, and it becomes more and more evident that the careful investigation of a few forms will not suffice to elucidate the others; they must all become the objects of much patient research."

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The Secretary exhibited an egg of the Mooruk (*Oasuarus bennetti*) from the island of New Britain, sent to him for examination by Capt. F. J. Evans.

The egg was obtained by Admiral Hoskins, late Commodore on the Australian Station.

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A communication was read from Mr. F. Moore, F.Z.S., containing an account of the Indian genera and species of the Lepidopterous subfamily Ophiderinæ.

This paper will be published in the Society's 'Transactions.'

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The following papers were read :—

1. Remarks on some Species of the Genus *Tyrannus*. By P. L. SCLATER, M.A., Ph.D., F.R.S., Secretary to the Society.

(Plate III.)

Mr. Ridgway has lately contributed to the 'Proceedings of the United-States National Museum' an excellent paper on the genus *Tyrannus*<sup>1</sup>. As I have a good series of examples of the species of this genus in my collection, and have paid some attention to the subject I beg leave to offer the following remarks on Mr. Ridgway's paper.

Mr. Ridgway's views as to the limits of the genus *Tyrannus* coincide very nearly with mine as expressed in my 'Catalogue of American Birds' and in the 'Nomenclator Avium Neotropicalium.' Mr. Ridgway allows 13 species of the genus *Tyrannus*, while Mr. Salvin and I in the last-named work only recognized 11. Mr. Ridgway's two additional species are *Tyrannus apolites* (Cab. et Heine) and a supposed new species which he proposes to call *Tyrannus luggeri*. As regards the first of these, it was omitted from our list, because it seemed probable that it might have been founded on a young individual of one of the races of *T. melancholicus*. And after again studying the original descriptions, I have no other reasonable conjecture to offer on the subject. Concerning *Tyrannus luggeri*, however, I can give some more certain information, Mr. Salvin having received from Mr. Ridgway in exchange an example of this species, which I now exhibit. As will be seen, *Tyrannus luggeri* of Demerara is identical with the bird called in my collection *Myiozetetes sulphureus* (Spix)<sup>2</sup>, and is, I think, better referred to the genus *Myiozetetes*, though a somewhat aberrant member of it, than to *Tyrannus*.

There remain, then, 11 species of *Tyrannus*, which both Mr. Ridgway and I acknowledge as veritable species of the genus; and, moreover, our names for them are fortunately the same, except as regards Mr. Ridgway's *T. carolinensis* and *T. dominicensis*, which in conformity with the Stricklandian Code I call *T. pipiri* and *T. griseus*. But I am more fortunate than Mr. Ridgway in having in my collection examples of *T. albigularis* and *T. niveigularis*, two species which are unknown to him. A few words upon these somewhat rare birds may be useful to Mr. Ridgway and to other ornithologists.

*Tyrannus albigularis*, Burm. Syst. Ueb. ii. p. 465, though most nearly related to *T. melancholicus*, is, I think, quite a distinct species. My example of it is an adult male, obtained by Natterer near Goyaz in Brazil, in July 1823. At first sight the pure white throat and want of any greenish tinge on the yellow breast render it easily distinguishable from *T. melancholicus*. Above the plumages of the two birds are more nearly similar, although the back of *T. albigularis* is decidedly of a more yellowish olive. The tail (fig. 1), is also

<sup>1</sup> "Descriptions of new Species and Races of American Birds, including a Synopsis of the Genus *Tyrannus*, Cuvier. By Robert Ridgway," Proc. U.S. Nat. Mus. i. p. 166 (1879).

<sup>2</sup> Cat. Am. Birds, p. 220.

me to select for the museum a small series of the rarer species represented; and amongst these is a single specimen of a Roller which appears to be very distinct from any of the described species. I give the following description of this interesting new form, and will append to it the notes on the bird which have been kindly furnished to me by the discoverer.

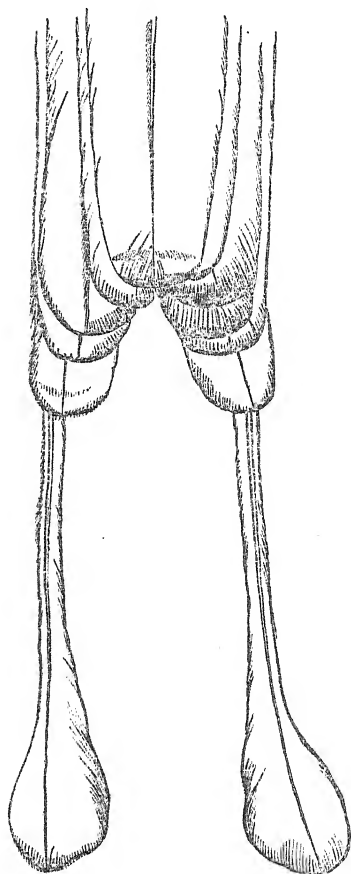
*CORACIAS SPATULATUS*, sp. nov.

♂. Forehead and superciliary stripe rather broadly white; top of head, neck, and back dull pale greyish-green mixed with cinnamon-brown, the latter colour predominating on the scapulars and lower part of the back; rump and upper tail-coverts ultramarine-blue, the coverts richer and deeper in colour; chin and a spot at base of lower mandible whitish; throat, breast, belly, thighs, and under wing- and tail-coverts pale bright verditer-blue, varied on the lower throat and breast by lilacine cinnamon-brown webs, leaving the shaft-stripes of the blue; cheeks and ear-coverts mixed lilac and verditer-blue; sides of neck coloured like the back; sides of breast dull sandy-brownish with bluish-white shaft-stripes; upper wing-coverts ultramarine, except a short central band of cinnamon-brown lesser coverts, which is edged on both sides by a few ferruginous-violaceous feathers; primaries black on inner webs, ultramarine-blue on outer webs, their basal portion on both webs (but only on the inner web of the first primary) pale bright verditer-blue; secondaries coloured like the primaries, except the last three, which are cinnamon-brown. Tail forked, the feathers increasing in length from the two middle ones, which are the shortest; the two outermost feathers are prolonged (their inner web being abruptly much narrowed)  $2\frac{1}{2}$  inches beyond the next feathers, and their extremity is rather broadly spatulated by the gradual widening of the inner and abrupt widening of the outer web; these spatulate feathers are light verditer-blue as far as their sudden narrowing, and thence wholly black (including the terminal expansion); the next feather on each side is verditer-blue, broadly tipped with blue-glossed black, which extends a good way along the inner web; the next is similarly coloured, but the dark portion extends much further towards the base; the following feather is dark-blue throughout, except that its base and a very thin edging of its outer web are verditer-blue; and the two middle feathers are wholly black except for a slight gloss of blue on each side of the shaft; on the underside of the tail the colouring is paler, and the dark parts of the feathers are shot with bluish-green. "Bill black; feet greenish-yellow; iris yellowish-brown" (*B. F. Bradshaw*).

Total length in inches (including long tail-feathers)  $15\frac{1}{2}$ ; length of culmen  $1\frac{1}{4}$ , of folded wing  $6\frac{1}{2}$ , of central tail-feathers  $5\frac{1}{4}$ , of outermost tail-feathers  $8\frac{1}{6}$ .

This fine Roller is in some respects intermediate between its two nearest allies, *C. caudatus*, L., and *C. abyssinicus*, Bodd., but is at once distinguished from them both by the spatulate form of the elongated outermost tail-feathers. Apart from this peculiar character,

the tail differs markedly in form from those of the two species named, being forked and having its two middle feathers the shortest, while that of *C. caudatus* has the feathers generally of about equal length, and in that of *C. abyssinicus* the two middle feathers are the longest. This furcate shape of the tail makes the produced outermost feathers of *C. spatulatus* look shorter than those of *C. caudatus*; but in fact they are just about the same length. (The corresponding feathers in *C. abyssinicus* are  $2\frac{1}{2}$  inches longer.) The bill and feet are



Terminal portion of tail of *Coracias spatulatus*, nat. size.

comparatively slender, the former being rather shorter than in *C. caudatus*. The upper-surface colouring much resembles that of *C. caudatus*; but the head and neck are not nearly so green, being almost uniform with the upper back; the wing-coverts are ultramarine-blue throughout except for a narrow cinnamon-brown bar, instead of

ultramarine-blue at the top succeeded by verditer-blue; the last three secondaries are uniform sandy-brown instead of fuscous and sandy-brown shot with greenish; in the tail the two middle feathers are black instead of dusky bronze-grey, and the feathers next to them on each side ultramarine glossed black instead of verditer-blue clouded with blue-grey; and the white forehead and eyebrows are very much broader and more conspicuous. The under surface colouring is deficient in the rich lilacine-purple which adorns the throat and entire breast of *C. caudatus*, though it exhibits traces of a similar hue on the sides. In comparison with *C. abyssinicus*, the upper surface differs more markedly than it does from that of *C. caudatus*, for in *C. abyssinicus* the head and neck are greenish-blue sharply separated from the uniform rufous-brown back; but on the under surface the coloration is the same, except that *C. abyssinicus* does not present either the lilacine or brownish which vary the sides of the face, throat, and breast in *C. spatulatus*. The tail-feathers (with the exception of the two middle and two outermost) have their colours just reversed in relative position, *C. abyssinicus* presenting pale-blue feathers with dark-blue bases, and *C. spatulatus* feathers pale blue at the base, but blue-black at their extremities.

Dr. Bradshaw informs me that *C. spatulatus* was not seen far from the Zambesi except once or twice, when he noticed it at about 80 miles distance to the south of the river. The species chiefly frequents the so-called "Sand-veldt," a tract of heavy sand-ridges, keeping about the tallest timber. In the winter months it makes its appearance in small companies of from four to ten or a dozen, but is out of plumage and very scarce during the rainy season, viz. from November to April. In flight and action these birds resemble the other Rollers, and are usually difficult to approach. They have a most peculiar harsh cry, which differs from that of the other species, and when once heard is easily recognized on repetition. The male specimen brought down was shot on the 23rd May, 1878, on the western boundary of the Leshumo valley, through the whole length of which water only runs during heavy rains. All the specimens seen had the extremities of the long tail-feathers expanded into the battledore form.

I have never before seen any example of this *Coracias* in the numerous collections made in the interior. The species is probably limited in its range and may thus have escaped notice; while it is not unlikely that the less observant collectors may have passed it by as *C. caudatus*.

### 3. Note on some Points in the History of the Synonymy of Echini. By ALEXANDER AGASSIZ, F.M.Z.S.

[Received January 10, 1880.]

The 'Proceedings' of the Society for March, May, and June, 1879, contain three short articles on Echini, by Mr. F. J. Bell, of the British Museum (see pp. 249, 436, and 655). As these articles are

evidently the forerunners of others, it would be premature to enter here into any discussion of the criticisms of Mr. Bell on the characters of this or that species; yet the tone adopted by Mr. Bell from the outset towards me calls for some counterstatement on my part, not on matters involving difference of opinion, but on questions which underlie the method I have adopted in the 'Revision of the Echini.'

In the first of the two articles (pp. 249 and 655) which alone concern us at present, it seems unnecessary to notice such quibbling as occurs on p. 252 in reference to the synonymy of *Echinus* and *Brissus*. When we come, however, to the omission of a synonym, this is of course, as Mr. Bell says, a more serious matter. I am accused (p. 252) of omitting in the synonymy of *Brissus unicolor* the name *E. unicolor*, Gmel., which I quote in the Chronological List, while I introduce in the synonymy *E. ovatus*, Gmel.

This charge I will answer by quotations from the 'Revision' (pp. 28 and 87):—

"In giving the synonymy of species which have become historical, . . . . it becomes a necessity to cull the long list of quotations misnamed synonyms, and to separate what is merely bibliographical from what constitutes the history of the name and the history of the species." . . . .

"Not to introduce too many doubtful synonyms, a general concordance of all the names given to Echini, including MS. names mentioned, is added, where doubtful synonyms will be found recorded by referring them to some species of this Revision."

If Mr. Bell will read the first page (p. 87) of the synonymy of the 'Revision,' and then look in the Synonymic Index (p. 187) under *Echinus unicolor*, he will find the very reference to the synonymy of *Brissus unicolor* on p. 97, which he states I have omitted.

He next says, p. 252, "the date of the specific term *unicolor* being then 1788, what is the date of *carinatus*?" But the date of *unicolor* is not 1788; it is 1734. Mr. Bell will find in the Chronological List, on p. 36, under "1734 Klein (continued)," *Brissus unicolor*! This means, as Mr. Bell can ascertain from the Revision (p. 87), that I had seen the original specimen of Klein's *Brissus unicolor*! [see Introd. Revision Echini, p. ix]. On one side therefore we have the statement of Mr. Bell that the date of *unicolor* is 1788, and on the other Klein's original of *B. unicolor* dating back to 1734, which leaves no choice of date.

I have throughout the Revision recognized the same principle with regard to original or authentic specimens, and quote again from it ['Revision,' p. 13]:—"As far as the question of priority of the specific name goes, the only guide I shall take is an original or authentic specimen . . . . the oldest name shall be preserved to the exclusion of all others, if the change is based upon authentic specimens, and not simply upon a figure, a guess, which may or may not be true." Carrying out the above views, I ascribed *carinatus*, of which I had seen an authentic specimen, to Lamarck, and placed *Echinus carinatus*, Gmel., in the Synonymic Index (p. 183), referring it to *Brissus carinatus*, Gray (p. 96).



As regards the name *carinatus*, neither Mr. Bell nor any one else can do more than make happy guesses until the original collection of Leske, upon which Gmelin based his name, is found and identified.

Passing now to p. 655, Mr. Bell himself quotes the reasons which have induced me to adopt *Hipponoë*, Gray, in place of *Tripneustes*, Agass. I will only state again as my reason a part of what he quotes on p. 656:—"When specimens are accessible which have served as basis for any systematic work, their results should be accepted, when correct, even when they upset a nomenclature generally recognized" ('Revision of the Echini,' p. 301). The questions of spelling and of sense or nonsense in generic names it is useless to discuss anew.

Professor Louis Agassiz himself suspected the identity of *Hipponoë* and *Tripneustes*, and says that Gray's name in that case should be preferred to his. While at the British Museum I endeavoured to trace the specimens on which Gray based his name *Hipponoë*. Dr. Gray himself was kind enough to show me what he called *Hipponoë* in 1840, the same species named by him *Hipponoë sardica* in 1855.

On the same page (656) Mr. Bell further says:—"In the Bibliographical List . . . . the only references appended to the name *Tripneustes* are 'Int. Monog. Scut.' (*sic*) and 'C. R. Ann. Sc. Nat. vi.'." He is quite astonished so easily to recognize the last reference, and, having assigned the first to the 'Monographie des Scutelles,' concludes by saying that he has searched the pages of the Introduction in vain for such a name. This statement he subsequently modifies by giving a bit of history about the second livraison of the 'Monographies d'Echinodermes' [Scutelles], in which he says there was published a "short essay" entitled 'Observations sur les progrès récents de l'histoire naturelle des Echinodermes.'

Mr. Bell does not state in what part of the second livraison this so-called "short essay" is placed, but leaves the reader to infer that the second livraison was composed of a series of monographs, of which the 'Monographie des Scutelles' made one, instead of being, as it actually was, the only one. In this introductory "essay" he finds *Tripneustes*, which antedates (July) its publication by Agassiz, in the preface to the 'Anatomie du genre *Echinus*' (December); he then goes on to say (p. 657):—"I do not think that there is any need to particularize such a method of detailing the history of a name in a work which is entitled a Revision; but I have thought it right, while giving an account of Professor Alex. Agassiz's method of working out his subject, to give all the material necessary for other naturalists who desire to investigate for themselves the matter in question."

It may not have occurred to Mr. Bell that I probably know as well as any one what Professor Louis Agassiz himself thought of this "short essay." As is well known to all students of Echinoderms, the Monographies were issued in livraisons, each livraison having a printed cover stating its contents; the general titlepage was issued

with the first livraison, containing the Salénies (1838). The special titlepage of this first monograph was preceded by a Preface, with separate paging in roman numerals. The cover of the second livraison (1841) says "contenant les Scutelles;" and nothing else relating to the contents is printed on it.

The special titlepage of this second monograph (Scutelles) is, like that of the first livraison, preceded by an Introduction, the "short essay" in question, headed "Observations . . ."; this has, like the Preface of the first monograph, a separate paging, but in arabic numerals. The contents of this so-called essay, in spite of the heading, show plainly enough that it was not considered at the time as a special essay, but that it was simply an Introduction to the livraison<sup>1</sup>. It was always so regarded by Professor Louis Agassiz; he invariably spoke of it as 'l'Introduction de la Monographie des Scutelles.' Nor was he alone in so regarding it; all writers on Echinoderms who have quoted these independent monographs (as I have done in the Revision) without reference to the number of the livraison, but entirely from the contents as printed on the cover, always quote this "essay" as 'Monographie des Scutelles (Introduction)'. I have only followed their example and that of Professor Agassiz himself.

It is, perhaps, unfortunate that this part of the 'Monographie des Scutelles' should be quoted in that way, on account of the Introduction following the special titlepage and dealing with the group of Scutellæ in general. But it does not justify Mr. Bell in assuming that he corrects a grave error and gives information not to be found in the Revision.

Mr. Bell states on p. 656 that he discovered only accidentally the history of this "essay," because he was fortunate enough to obtain an unbound copy of the four parts of the 'Monographies d'Echinodermes' as originally published. It is rather strange that so exacting a critic as Mr. Bell should be dependent for his information (which is after all incomplete) upon a bookbinder.

Notwithstanding all Mr. Bell has said or may say, the fact still remains that in July 1841 the name *Tripneustes* first appears, as is stated in the Chronological List of the Revision, and that it did not appear for the first time, as Mr. Bell maintains, in the Preface to Valentin's 'Anatomic du genre *Echinus*,' published in the following December.

Mr. Bell will perhaps learn as he goes on that Professor Louis Agassiz omitted to recognize several of the genera first named by him in this same Introduction to the 'Monographie des Scutelles,' and

<sup>1</sup> Separate copies of the Preface of the first livraison of the 'Monographies d'Echinodermes' were distributed as a prospectus, to obtain subscribers for the work; the heading on the titlepage being "Monographies d'Echinodermes (Extrait de la première livraison de cet ouvrage, qui renferme une Monographie des Salénies vivantes et fossiles)."

In a like manner and for the same purpose separate copies of the "short essay" (Observations . . .) were also distributed with a corresponding heading:—"Extrait de la seconde livraison de cet ouvrage, qui renferme une Monographie des Scutelles vivantes et fossiles)."

that considerable confusion has arisen in the generic synonymy from their omission at the time of the publication of the *Catalogue raisonné* of Agassiz and Desor.

Mr. Bell's reference to the '*Nomenclator Zoologicus*,' March (1842), in support of his position that Professor Agassiz believed he first used the name *Tripneustes* in the Preface of the '*Anatomie du genre Echinus*,' only proves that it was not correctly quoted in the '*Nomenclator*.' Of the genera mentioned for the first time in the Introduction to the *Monographie des Scutelles* we find *Temnopleurus*, *Pleur-echinus*, *Amblypneustes*, *Tetrapygus*, and *Agarites* referred correctly in the '*Nomenclator*' to the 2nd livr. Monogr. d'Echinod.; while *Mycrocypus*, *Tripneustes*, *Toxopneustes*, and *Stomopneustes*, which accompany them and are designated in precisely the same manner by reference to a well-known species, are all quoted in the *Nom. Zool.* as 4th livraison, where they also occur as well as *Salmacis* and *Holopneustes*. The last two genera appear in the 4th livr. for the first time; yet *Salmacis* alone is correctly quoted in the '*Nomenclator*,' while *Holopneustes* is omitted and is not found in the '*Nomenclator*' at all.

On p. 657, Mr. Bell further says "the name *variegatus* is never used by any writer on the genus *Tripneustes* subsequent to Leske and prior to Alex. Agassiz."

I must again refer Mr. Bell to p. 35 of Chronological List; there he will find that I had seen the original of Klein's *Cidaris variegata*, and naturally retained that name in preference to *angulosus*. It is therefore obvious that, on the principles which have guided me in the '*Revision*,' the name which I must use is *variegata* and not *angulosus*.

I am perfectly aware that many and very annoying mistakes (of omission and commission) have crept into the '*Revision*'—which by the way was published in 1872-74, and not in 1872-73 as is stated by Mr. Bell on p. 249; no one will be more pleased to see them corrected than myself, even when shown up so pointedly as is done by Mr. Bell.

I fail to see that Mr. Bell has by his criticisms of the nomenclature of the '*Revision*' established a single one of his points or supplied any material not already there, though evidently it is not in a form suited to his wishes. I wish therefore once for all to protest against any further misrepresentations of the facts on his part.

As the Synonymy of the '*Revision*' is based upon specimens and not upon names, I have endeavoured so to arrange the Chronological Lists, Synonymy, and Synonymic Index as to leave Echinologists free to adopt any name suited to their views of nomenclature and not to force upon them my peculiar views. I have also attempted to supply the materials necessary for independent investigation with a minimum waste of time.

Judging from the criticisms I have thus far received from other naturalists, I have no cause to complain of the time spent on the '*Revision*,' although it is plain that I cannot hope the '*Revision*' will be of any use to one who, like Mr. Bell, is of opinion that "for the

British naturalist, unfortunately Professor Agassiz's method of nomenclature prevents this desirable result."

Having now examined at length these first articles of Mr. Bell, I shall in future leave like criticisms from him to seek their own answer, and close here, as far as I am concerned, this unprofitable discussion.

Museum of Comparative Zoology,  
Cambridge, Mass., Dec. 30, 1879.

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February 3, 1880.

Professor Flower, LL.D., F.R.S., President, in the Chair.

Captain W. V. Legge, R.A., exhibited a series of specimens of Little Ringed Plovers from Ceylon and Central India; and remarked that it had been a moot point as to whether there really were two species of Little Ringed Plover in India, some writers referring all the birds found in that country to one form—the Lesser Ringed Plover of Europe, *Ægialitis curonica*. This, however (the larger form), was a winter visitant, for the most part, both to the Peninsula and to Ceylon, whereas the smaller form of Ringed Plover was, as far as he could judge, a resident in the latter island, as he had found it breeding there on the shores of the tanks in the northern forests. Jerdon had recognized two species of Ringed Plovers in his 'Birds of India,' the smaller of which (the one now exhibited) he had called *Æ. minuta* (Pallas). Jerdon had pointed out most of the distinguishing characters of this species, viz. its smaller size, the greater amount of yellow on the bill, and its smaller legs and feet, as well as some other features which did not appear to hold good. In addition to the smaller wing, which did not attain a greater length than 4.3 inches, Captain Legge pointed out the black loreal band was narrower, and in many specimens did not extend across the base of the bill at all, leaving the whole of the forehead white; the black pectoral band was likewise narrower; and, in addition to these characters, the naked eyelid was very broad, tumid and protuberant, and deeply corrugated, which did not appear to be the case with the larger species, *Æ. curonica*. Blyth also had remarked, in a paper published in the 'Field' of 28th May, 1870, that the smaller Ringed Plover of Southern India was characterized by its very much broader naked orbital ring; so there could be no doubt that this was a peculiar feature of the bird in question. The note of the species, as observed at its breeding-haunts in Ceylon, was also different from that of the larger form.

Pallas's title *Charadrius minutus*, had been given by that author in the 2nd volume of his 'Zoographia,' p. 145, to a bird found on the lakes of the Barabinski steppes in Western Siberia; and the description was that of the young of *Ægialitis curonica*, which is found in that region. Horsfield had applied the name of *Charadrius pusillus* to a small Ringed Plover from Java; but Mr. Harting had seen

the type specimens, and was able to assert that it was the young of *Ægialitis curonica*; and had in his possession a specimen from Formosa, measuring 4.4 in the wing, which was the facsimile of Horsfield's type. As the smaller Indian Ringed Plover was without a name, Captain Legge proposed that one should be given it, and, after some discussion on the matter, agreed that it should be styled *Æ. jerdoni*, in compliment to Dr. Jerdon, who had pointed out its specific characters, although he had applied an erroneous title to it.

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The following papers were read:—

1. On a new Species of Heron from Mohambo, in Northern Madagascar. By Dr. G. HARTLAUB.

[Received January 20, 1880.]

*ARDEA RUTENBERGI*, n. sp.

*Pileo et nucha cristata nigro-æncis; fascia postoculari rufescenti-fulva, alteraque inferiore latiore et brevior pileo concolori; collo postico et laterali, pectoris lateribus abdomineque medio obscure cinerascens, nonnihil fulvo-brunnescenti lavatis; mento et gula albidis, maculis nonnullis rufescentibus longitudinaliter notatis; collo antico superiore in fundo rufescenti-fulvo, maculis obscurioribus irregulariter vario; inferiore, pectore et epigastrio mediis ex aurantiaco fulvescentibus; abdomine imo, crasso et subcaudalibus eodem colore lavatis; dorso, tergo, uropygio scapularibusque (subelongatis et sublanceolatis) nitide æneo-viridibus, his strictissime et vix conspicue rufescenti marginatis; alarum tectricibus omnibus æneo-virescentibus, dilute rufescenti marginatis; remigibus obsolete virescentibus, limbo apicali strictissimo albedo; subalaribus albo et rufescenti variis; cauda virescente; pedibus fuscis; maxilla fusco-nigricante, mandibula flavido-pallida, tomis obscuris. Long. rostr. a fr. 62 millim., alæ 190, tarsi 57, dig. med. c. ung. 53.*

This new Heron is a typical member of the *Butorides* group (*A. virescens*, *scapularis*, *javanica*, etc.), and will take its systematic position next to its nearest ally, *Ardea atricapilla*.

The differential characters of this new bird are very striking ones, and such that to confound it with any of the congeneric species seems out of the question.

The neck and sides of the head, which are of a pure and light bluish grey in *A. atricapilla*, are of a dull brownish grey with an indistinct rufous hue in our new species. The marginal linings of the wing-coverts, whitish in *A. atricapilla*, are of a fine light fulvous-red in *A. rutenbergi*. The underparts, pale bluish grey in *A. atricapilla*, are of a darker brownish grey with a conspicuous shade of ochraceous, and the foreneck and middle of breast are rather of a

clear fulvous-orange; the same colour reappears in the hind part of the abdomen and the under tail-coverts.

But the greatest difference between our new species and *A. atricapilla* is to be seen in the structure and colour of the back-feathers and the scapulars, these being very narrow, elongate and lanceolate, and of a peculiar sea-green colour, with hoary margins, in *A. atricapilla*; they are broader, shorter, much less lanceolate, and of a pure and uniform bronze-green in *A. rutenbergi*.

The measurements in both birds are nearly the same.

The fine adult type specimen of *A. rutenbergi*, from which this description is taken, is in the Hamburg Museum of Natural History. I have named the species after my much-lamented young countryman, Mr. Christian Rutenberg, who was murdered by the savage tribes of the west coast of Madagascar. I see from his diary, that he had been eager in collecting and preparing birds; and it is certainly much to be regretted that in all probability his collections are lost.

Dr. Reichenow, of the Berlin Museum, to whose experienced eye I have submitted this little Heron, fully participates in my opinion of its being different from any of the congeneric species.

2. On the *Myoxus elegans* of Temminck. By OLDFIELD THOMAS, F.Z.S., Assistant in the Zoological Department, British Museum.

[Received January 20, 1880.]

The British Museum has lately received a specimen of a small Dormouse obtained by Mr. H. Pryer near Yokohama, which agrees in every respect with Temminck's *Myoxus elegans*, described and figured in the 'Fauna Japonica' (1842). This name had, however, been unfortunately preoccupied by Ogilby for a South-African species<sup>1</sup>, and now stands as one of the synonyms of *Graphiurus capensis*, F. Cuv.<sup>2</sup> I am therefore under the necessity of renaming the Japanese form; and I would propose for it the name of *Myoxus lasiotis*, the tufts of hair at the base of its ears being its most noticeable external character.

This animal by its external form appears to be, as Temminck remarks, very closely allied to the common European *Muscardinus avellanarius*, agreeing more or less with that species both in size, colour, and proportions; but on examining its viscera, I find that there is no trace whatever of that extraordinary complication of the stomach, unique among Mammalia, which has led to the retention, by most recent zoologists, of Kaup's genus *Muscardinus*, formed for the reception of the common Dormouse.

The absence of this complication proves that *Myoxus lasiotis* is not so nearly allied to *M. avellanarius* as Temminck supposed,

<sup>1</sup> P. Z. S. 1838, p. 5.

<sup>2</sup> Cf. Alston, P. Z. S. 1875, p. 317.

because it therefore belongs to the restricted genus *Myoxus*, characterized by a simple stomach and a bushy distichous tail. Its nearest ally is *M. dryas*, Schreb., found in South-eastern Europe, Asia Minor, and Persia.

*Myoxus lasiotis* is, according to Temminck, very rare in Japan: his original specimens were obtained from the province of Awa, in the island of Sikok; and I can find no others recorded until the arrival of this one from Yokohama.

*Note.*—Since writing the above I have discovered that this species has been renamed *M. javanicus* by Schinz, in the appendix to his ‘Synopsis Mammalium.’ As this name is incorrect and misleading, the species still requires a new name, in accordance with rule xi. of the Stricklandian code.

### 3. Description of a new Species of Simple Coral.

By H. N. MOSELEY, F.R.S.

[Received January 22, 1880.]

#### DESMOPHYLLUM LAMPROTICHUM, sp. nov.

Corallum straight, conical, the upper third expanding much more rapidly than the lower two thirds, moderately compressed. Wall both externally and internally tinged with a madder-red colour, excepting at the base and close to the margin of the calicle. Probably fixed by a narrow base (specimen broken at the base). External surface of the wall covered entirely with a very glistening and transparent epitheca, which is seen where broken towards the base to be present in several successive layers investing one another. Costæ marked as fine striæ over the entire outer surface; the primaries, secondaries, and tertiaries equally developed and more marked than those of lower order. Undulating accretion-lines present on the upper part of the wall.

Calicle oval in outline, ratio of the axes about 86 to 100. Summits of the longer axis slightly higher than those of the shorter. Margin of the calicle nearly even, very slightly excavated opposite the intervals between the septa of the first three orders, and minutely denticulate in correspondence with those of lower order. Septa regular, in six systems and five complete cycles. Primary and secondary septa equal, far exsert, with evenly rounded upper margins; tertiaries much less exsert, with straighter free margins; quaternaries and quinquaries proportionally very small, the quinquaries not extending to the margin of the calicle, the quaternaries reaching thus far only occasionally. Septa white, thin and delicate, slightly sinuous at the inner margins, with lines of granules on their faces. Fossa deep, gradually narrowing inferiorly, bounded by the margins of the primary and secondary septa.

Extreme height of the corallum 35 millims.; extreme length of the calice 35 millims.; extreme breadth of the calice 26 millims.

The single specimen on which the species is founded was purchased from a dealer, Mr. Cutter; and its locality is unknown. It will be placed in the British Museum. Its nearest ally is *Desmophyllum caileti*, Duch. & Mich., which was obtained during the United-States deep-sea dredging operations from 100 fathoms off Barbadoes, and also off Double-Headed Shot Keys from 615 fathoms<sup>1</sup>. From its appearance the species might be supposed to come from rather deep water; but its having found its way into the hands of a dealer is against this hypothesis.

From *D. caileti* the present species differs markedly in its colour,

Fig. 1.

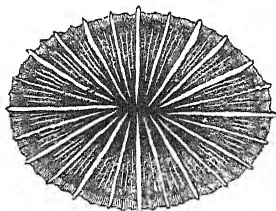
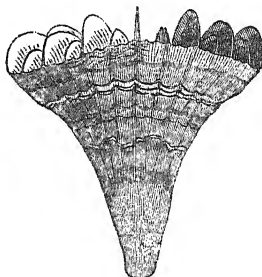


Fig. 2.



*Desmophyllum lamprotichum*, of the natural size.

Fig. 1. View looking directly into the mouth of the calice.

Fig. 2. The corallum viewed from the side.

its larger size, and in its rapidly expanding form, also in the very smooth and glistening appearance of its epitheca. The fact that the entire outer surface of the coral is covered with this shining epitheca would seem to show that this entire surface of the corallum remained covered with living tissue during the whole growth of the animal.

It will probably be necessary to form a special genus for those corals at present included in the genus *Desmophyllum* which are straight and delicate in structure, have a shining epitheca, and never form roots, like *Desmophyllum crista-galli*.

<sup>1</sup> See Il. Cat. Mus. Comp. Zool. Harvard, "Deep-Sea Corals," by L. F. de Pourtales (Cambridge, Mass. 1871), p. 16.





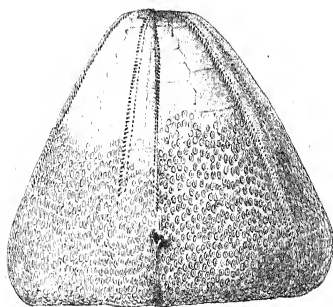


Fig. 3.

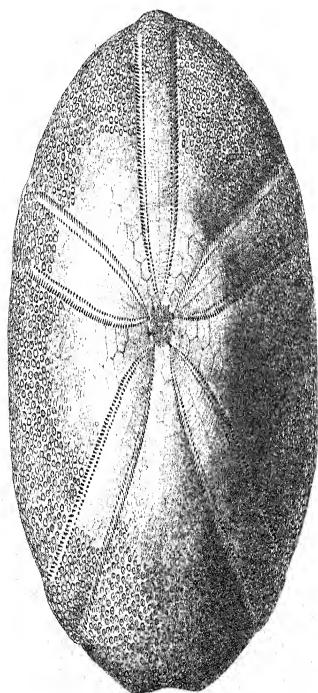


Fig. 1.



Fig. 4.

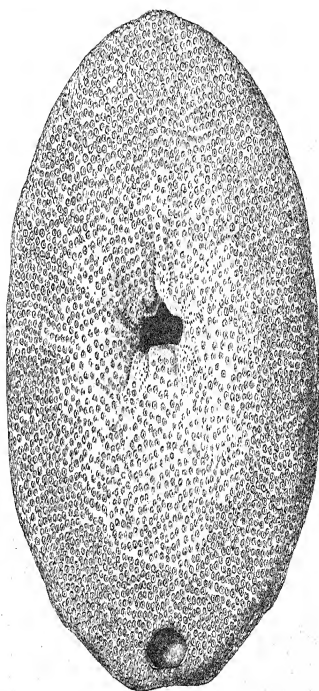


Fig. 2.

*PALEOLAMPAS CRASSA*

Münsterberg imp.



4. On *Palæolampas*, a new Genus of the Echinoidea. By F. JEFFREY BELL, B.A., F.R.M.S., F.Z.S., Professor of Comparative Anatomy in King's College, London.

[Received January 27, 1880.]

(Plate IV.)

There is, perhaps, no experience which is more full of instruction to the zoologist than the discovery of forms as recent that have been previously regarded as extinct. In no group of the animal kingdom have the explorations of the last few years reaped so large a harvest as among the Echinoidea, as *Salenia* and *Conoclypeus*<sup>1</sup> would suffice to bear witness, were not such forms as *Phormosoma* and *Asthenosoma* still more remarkable. But there is yet another possibility—possible, indeed, in the case of terrestrial animals, but infinitely more probable in the case of deep-sea forms; it is this: we may at times be fortunate enough to find examples of genera which, though hitherto not registered as fossil, yet proclaim by their general aspect, structure, and relations their archaic characters and the great length of time during which they must have existed as distinct forms. Prime among such creatures stands the remarkable *Brisinga*, which, though “the most primitive and therefore the oldest of all Echinoderms,”<sup>2</sup> has not yet been known to naturalists for a quarter of a century<sup>3</sup>.

Very far from being either as important or as interesting as this ancient Starfish, the irregular Echinid which I now propose to describe to the Society is of interest as filling a gap in our series of forms. Nearly every naturalist who has seen it has at first thought that he had seen it before; but further investigation has, in all cases, led to the view that the form is different from any yet observed. To this statement there is but one exception: Dr. R. H. Traquair, F.R.S.E., of the Museum of Science and Art in Edinburgh, informed me some months ago that he had a specimen generically, if not specifically identical, which had come into his hands when the collection of the late Dr. S. P. Woodward was dispersed. Dr. Traquair most kindly and generously offered to send me notes and drawings of this specimen; but the arduous duties of his post at Edinburgh have been hitherto an obstacle in his way; and while I regret that I have to describe the specimen in the collection of the British Museum without giving an account of the Edinburgh example, I have felt too much sympathy with my friend and colleague to have pressed him too hardly to add to his labours. Some day, perhaps, in the future Dr. Traquair will himself give an account of the form under his care.

The specimen now to be described came into the possession of the Trustees of the British Museum so long ago as January 1852; but it

<sup>1</sup> A. Agassiz, Bull. M. C. Z. v. no. 9, p. 190.

<sup>2</sup> G. O. Sars, ‘Researches on the Structure and Affinity of the genus *Brisinga*’ (1875), p. 94.

<sup>3</sup> ‘Fauna littoralis Norvegiæ,’ ii. (1856) p. 95.

was not mentioned or described by the late Dr. Gray in his 'Catalogue of the Recent Echinida,' published in 1855. It is much worn and has much the appearance of a fossil specimen; in the opinion of Prof. Morris and of Dr. Henry Woodward, F.R.S., however, the specimen is recent. It was bought at Stevens's sale-rooms, and is, with a doubt, reported to have come from India. To the accomplished palæontologist just named I have to express my thanks for instructed guidance through the cabinets under his charge; and while I take on myself all responsibility in describing this form, I would say at once that it is the fact that it was unknown to Dr. Woodward which has chiefly led me to regard it as new.

As we pass in review the edentulous forms of the Irregular Echinoidea, we are led irresistibly to the conclusion that the shortening of the ambulacra and the arrangement of the pores in the mode which has led Prof. Hückel to give to the group the name of *Petalosticha*<sup>1</sup>, are structural changes which have gone hand in hand; and, just as we may say of the ungulate Mammalia that their limbs tend to become modified by the reduction of the outer digits, and that, where success is attained, this reduction is accompanied by concomitant changes in the relations of the metacarpal or metatarsal bones to the carpus or tarsus<sup>2</sup>, or of the Araneina that they have tended to limit their stigmata to two<sup>3</sup>, so may we say of the *Petalosticha* that the arrangement of the ambulacral pores in straight parallel rows is more ancient than that in which the greater number are set in petaloid fashion. So far the generalization is borne out by the evidence of the palæontological succession, while some of the observations of Alex. Agassiz seem to support it on the embryological side. Perhaps we may go a step further and say, with safety, that the longer, the more regular, and the straighter are, step for step, older arrangements than rows of pores less long, less regular, or less straight. It is obvious that all kinds of stages may be found in this series if the regular and orderly modification of the Echinoderm structure has taken place in the non-saltatory fashion which it is now the mode to ascribe to the process of Evolution; but there is another possible process which it is, after all, not so much more difficult to present distinctly to the imagination; and that is progression by leaps of varying breadth<sup>4</sup>. Prof. Agassiz has drawn attention to the sudden transitions which he has observed in the growth of an individual, and to the apparently sudden appearance of genera in their geological succession. Let us test these two conflicting views by the evidence afforded by the new genus; but before doing so, let us point out that, even if we shall find evidence in favour of the sudden or, as we may call it, saltatory character of the transitions, it is just what we seem to find also in the developmental history of the individual; so that it affords us, just as well as any more steady succession, quite as complete a demonstration of the

<sup>1</sup> Gener. Morphologie, ii. p. lxxiv.

<sup>2</sup> Kowalevsky, Proc. Roy. Soc. 1873, p. 153.

<sup>3</sup> Cf. Bertkau, Archiv für Naturg. 1878, pp. 351 *et seq.*

<sup>4</sup> In the sense, of course, that the intermediate forms were so rapidly passed over that the chance of their being preserved is practically *nil*.

aphorism "The development of the individual is a compressed epitome of the development of the race;" and we may further look for an explanation of the suddenness of the changes in the supposition that between definite points in organization neither the larval form nor the adult are enabled to maintain that equilibrium in the presence of external forces which is necessary to the maintenance of existence<sup>1</sup>. Whether this be so or not, neither the doctrine of Descent nor the "fundamental principle of biogenetic development" has its truth in any way affected thereby.

It is with considerations of this kind in our mind that we must, as I think, address ourselves to the consideration of intermediate forms; for, in our times at least, it is only when observation is kindled by the light of the doctrine of the Descent that the full value of "inosculant forms" can be justly estimated.

### *Description of the Specimen.*

*Ambulacral system.*—The paired arrangement of the ambulacral pores does not extend beyond the ambitus, which is very nearly reached by all the five sets, but most completely by the two postero-lateral; the two rows of each are, in the case of the postero-lateral and of the anterior ambulacrum, altogether equal; but in the antero-lateral ambulacra the anterior row of pairs of pores is a little shorter than the posterior, and this difference is best marked on the left side; the strictest parallelism is observed between the paired rows, which incline so slightly towards one another that the diminution in breadth of the intraambulacral space cannot be detected by the eye until the pores come close to the central or apical system; here the pores diminish considerably in size, but there is no bare space separating the perforated ambulacral plates from the azygos radial plate, ordinarily known as the ocular. The pores of the inner row in each pair are still fairly circular; those of the outer are more slit-like or comma-shaped; and it is evident, so soon as several different pores have been examined, that the specimen in question exhibits a commencement of that union of the two pores by means of a connecting furrow which is very much more, and quite distinctly, marked in *Echinolampas*, and is even to be seen in *Conoclypeus leskii*, Goldfuss<sup>2</sup>. The spacing-out of the ambulacral pores as they approach the point at which the paired arrangement ceases to obtain is here but barely marked; and, indeed, it would be impossible to detect it at all, were we not led to look for it from the marked degree which it reaches in *Echinolampas*; so, again, while it is in some cases possible to see that the terminal pores of the outer row of the ambulacra are as completely circular as those of the inner row, and so far to find an analogy with the much more marked similarity in *Echinolampas*, yet in the cases of other rows on the same

<sup>1</sup> The probability of sports leading to very considerable and remarkable changes in organization has, comparatively lately, received support from the observations of Mr. Bullar on the hermaphroditism of certain parasitic Isopoda (Journ. Anat. & Phys. vol. xi. pp. 118-124).

<sup>2</sup> 'Petrefacta Germaniæ,' tab. xlii. figs. 1, a-c.

specimen the difference between the outer and inner pore can still be observed, just as well as in the upper portion of the rows. What, however, is more remarkable now remains to be noted: the outer row of pores may be traced from the point where they cease to be accompanied by the inner row as far as the actinal region, and that with complete regularity of spacing, and in lines which only here and there diverge from being completely straight; when they reach the phyllode they of course exhibit some modification; but that is of no importance for the moment. What we have here is the regular repartition of one row of pores from the apical to the oral pole. In this, as in several other points, the specimen under description approaches the genus *Conoclypeus*, the existence of which in the present epoch has been lately signaled by Prof. Alex. Agassiz<sup>1</sup>: in *Conoclypeus sigsbei* the paired arrangement of the ambulacral pores does not extend over more than two thirds of the abactinal surface, while *C. anachoreta*, Agassiz (L.), is seen to retain the paired arrangement from the apical to the oral area (see Desor, *Échinides fossiles*, pl. xxxiii. figs. 5-7).

We may find, then: the following series:—

*Conoclypeus anachoreta*: pores in pairs extend over the whole of the ambulacral area.

*Palæolampas*, nov. gen.: pores in pairs extend to the ambitus; outer row extend to the peristome regularly.

*Conoclypeus sigsbei*: pores in pairs extend over part only of the abactinal area; outer rows as in *Palæolampas*.

*Echinolampas*: pores of corresponding paired rows unequal.

*E. depressa*: pores of outer rows extend regularly to actinostome.

*E. oviformis*: pores of outer row not regularly distributed on the plates between ambitus and actinostome.

*Neolampas*: pores in single row (paired arrangement altogether lost).

Whether the mass of their characters is not such as to justify the union of *C. anachoreta* and *C. sigsbei* in a single genus, and the generic separation of the new form (*Palæolampas*), is a point which I will discuss later on. The table as here arranged, seems to throw discredit on the union of *Echinolampas depressa* and *E. oviformis* in the same genus; but there are other points of importance in the structure of the Echinoderm than the characters of the ambulacral system, and these must have their due weight.

The bourrelets of the actinal system are distinct, but they do not project into the buccal cavity; they are well rounded, not pointed at all, and may be said to be due rather to the development of the phyllodes, which mark off the interambulacral periphery of the actinostome, than to any modification in the interambulacral plates themselves; judging from the photograph of *C. sigsbei*, they are less developed than in that new form, while they have no such sharp projection as in *Echinolampas oviformis*; the outer row of pores bends slightly outwards, and then inwards so as to approach its fellow;

<sup>1</sup> Bull. Mus. Comp. Zoology, v. no. 9, p. 190.

between these there are a few pores not very regularly or definitely arranged, but apparently not so extensive as in *C. sigsbei*.

The ocular plates are very distinct; but two of the pores, the anterior median (which is almost obliterated), and the left postero-lateral, are smaller than the rest; those of the right side are both interesting as exhibiting indications of their primitively double character—a point to which Prof. Lovén has called attention in his invaluable 'Études'<sup>1</sup>, and which, as is well known, is so distinctly marked in *Palæechinus* among older forms<sup>2</sup>.

*Interambulacral system.*—The interambulacral arææ are composed of large broad plates and are considerably wider than the ambulacral, but there are no points of especial importance to be noted with regard to them; the odd posterior genital plate has disappeared, and the madreporic plate occupies the whole of the central portion of the apical area. The two postero-lateral pores are a very little more widely separated from one another than are the more anterior pair; but the divergence is not in any way so marked as it is either in *Echinolampas* or in *Conoclypeus sigsbei* (cf. fig. 2, p. 190, t. c.): this may be taken as an expression of the greater equality of the several genital ocular plates, and as, *pro tanto*, an indication of a more archaic arrangement.

The anus is elongated from side to side, is of some size, and is placed just below the margin of the test: in *C. leskii* the anus is rounded; in *C. sigsbei* it would appear to be elongated transversely; but in the greater number of the members of the genus *Conoclypeus* it would appear, from the definition of Agassiz and Desor—"anus infra-marginal, allongé dans le sens du diamètre antéro-postérieur"—to be elongated along the axis at right angles to that in which it is elongated in our specimen.

The whole test is covered regularly by primary tubercles, all equal in and of some size; the only region in which there is the very slightest irregularity is in the intraambulacral region just in front of the mouth, where the tubercles are a little less closely packed; this arrangement is exceedingly interesting when compared with what obtains in *Echinolampas*. We have already had some examples of the archaic characters presented by *E. depressa*; and when we compare it on this point with *E. oviformis*, we find that in the former the tubercles are evenly distributed over the whole test, and that there are no bare bands, while in the latter a tract free from tubercles extends both forwards and backwards from the region of the actinostome.

Coming now to the final consideration, we have to inquire into the position of the apical system and of the actinostome. They have both left their central position, but have proceeded a very slight distance forwards; and the distance from the centre of the test is by no means so great as it is in the genera *Echinolampas* or *Rhynchopygus*, though it seems to be greater than in *Conoclypeus sigsbei*.

<sup>1</sup> Lovén, "Études sur les Échinoidées," Kongl. Svens. Vetensk. Handlingar, Bd. ii. no. 7, p. 67.

<sup>2</sup> Dublin Quarterly Journal of Science, v. (1865), plate vii. fig. B.





from *Echinoneus* it is distinguished by the fact that the paired pores do not extend from apex to actinostome; with the remainder of the Cassidulids, however, it has considerable affinity. In several points it presents resemblances to *Rhynchopygus*; but this curious genus is sharply distinguished by the position of its anus; *Neolampas* has but a double row of simple pores<sup>1</sup> in each ambulacral area; *Echinolampas* has one of its two paired rows of pores considerably shorter than the other in each ambulacrum; and *Conoclypeus*, with which *Palæolampas* presents the greatest affinity, differs from it in having retained the primitive position of the mouth, and in nevertheless having obtained large bourrelets, as well as having the pairs of pores united by grooves<sup>2</sup>; *Conoclypeus* also has the apical system specially modified into a projecting button-like piece, and has the ocular plates very small.

On the whole, then, *Palæolampas* seems still to retain in its organization points of structure which show that it either diverged from the Cassidulid stem rather earlier than *Conoclypeus*, or that it stands in the direct line which connects this genus, first seen in the Cretaceous epoch, with a still more generalized ancestor. As it presents, therefore, a grade in development, we can only justly recognize the value of the characters which it presents by forming for it a special genus; and the name which is proposed seems to be one that it is justified by the characteristics herein detailed.

Returning to the question with which we started, we find, I think, that the existence of an intermediate form of this kind, continued on for so long a period of the world's history, as it is almost certain it has been, must make us very careful as to accepting any statements which seem to throw discredit on that principle of most modern evolutionists, which ascribes the origin of species to the effects of variations, not always seen by the unobservant eye. And while the explanation suggested as to the instability of certain combinations of anatomical characters may throw light on some of our difficulties, it is hardly yet time for us to cease giving the proper weight to our limited opportunities, and the imperfections of the records of the past, or, on the other hand, to forget how species best adapted for investigation are not always those that have most completely retained an uneffaced record of their past changes.

#### DESCRIPTION OF PLATE IV.

- Fig. 1. *Palæolampas crassa*: view of the abactinal surface, to show the disposition of the rows of pores, and the character of the plates of the corona. Natural size.
2. *P. crassa*: view of actinal surface, to show the characters of the bourrelets and phyllodes in the distribution of the ambulacral pores. Nat. size.
3. *P. crassa*: profile view. Nat. size.
4. Abactinal system, enlarged, to show the size of the ocular and genital plates, the characters of the ocular pores, and the position of the madreporic plate.

<sup>1</sup> See Wyville Thomson, 'Phil. Trans.' vol. clxiv. pt. 2, p. 745.

<sup>2</sup> In *C. leskii* the actinostome is some way in front of the centre; but it is a question whether this species truly belongs to the genus *Conoclypeus*.

5. On the Mammals of Asia Minor.—Part II. By CHARLES G. DANFORD, F.Z.S., and EDWARD R. ALSTON, F.L.S., F.Z.S.

[Received February 2, 1880.]

(Plate V.)

Three years ago we gave an account of the species of Mammals observed and collected by Danford during a visit to Asia Minor in the winter and spring of 1875–76, incorporating the statements of the few previous writers on the fauna of that country<sup>1</sup>. The following pages contain the additional information which he obtained during another visit in the winter of 1878–79.

On this second expedition Danford spent most of his time in the extreme south-eastern provinces of Asia Minor. The principal stations where he collected were :—the island of Rhodes ; the eastern Taurus Mountains near Marash ; the valley of the river Pyramus or Jihan, in the provinces of Marash and Adana ; the Giaour-Dagh, a northern continuation of the Lebanon range ; and the valley of the river Euphrates, at Biledjik. Thence his route took him through part of the Palanga Plain near Albistan, and the Anti-Taurus Mountains, over the central tableland of Asia Minor by Kaisariyeh, Angora, Sivre-Hissar and Eski-Shehir, to Broussa, near the Sea of Marmora<sup>2</sup>.

Although, as on his former trip, the time spent by Danford in the country was limited to the colder months, still we are able to add *eleven* species to our previous list, of which *one* appears to be new to science. We believe, on the other hand, that *three* species of our first catalogue were wrongly identified ; and we now recognize *forty-six* species as being certainly represented in the fauna of Asia Minor, besides nine or ten others of which the occurrence, though recorded, is not fully authenticated. Much still remains to be done by future explorers, especially among the Bats, Insectivores, and Rodents.

As in our previous communication, the species of which specimens were brought home by Danford are marked with an asterisk ; while those of which the evidence of occurrence seems doubtful are not numbered and are enclosed in brackets. References are given to our former paper, and the species which were not included in it are indicated by a dagger mark. The same authorities have been consulted as to distribution of the species in the adjoining countries.

We must express our thanks to our friends Dr. Günther and Mr. Thomas of the British Museum, where most of the specimens described have been deposited, and to Professor Alphonse Milne-Edwards of Paris for assistance ; also to Dr. Strauch of St. Petersburg, who has kindly given us much information as to the Wild Sheep of South-western Asia.

1. \*VESPERUGO SEROTINUS (Schreb.). Danf. & Alst., no. 1.

<sup>1</sup> P. Z. S. 1877, pp. 270–281, pl. xxxi.

<sup>2</sup> A map, showing Danford's routes in his two expeditions, is given in his "Further Contribution to the Ornithology of Asia Minor," Ibis, 1880, p. 81, pl. ii.

## 2. \*†VESPERUGO KUHLI (Natt.).

Specimens of Kuhl's Bat were taken at Marash from the wood-work of a house, and others were shot at Room Kaleh on the Euphrates. The species appeared to be common in both localities.

## 3. \*CROCIDURA LEUCODON (Herm.). D. &amp; A., no. 2.

## 4. ERINACEUS EUROPÆUS, Linn. D. &amp; A., no. 3.

As on his former visit, Danford failed to obtain specimens of the Asia-Minor Hedgehog in a fit state for preservation; but he found one or two decomposing carcasses which were evidently referable to this species.

## [FELIS UNCIA, Schreb. D. &amp; A., no. 4.

We introduced the Ounce into our first list on the authority of our friend Mr. D. G. Elliot, who informed us that the type of Valenciennes's *Felis tulliana*, now in the Paris Museum, was not separable from *F. uncia*, an opinion which had been already expressed by Blyth<sup>1</sup> and by Gray<sup>2</sup>. Mr. Elliot has since maintained this identification in his magnificent work on this family<sup>3</sup>, whereas Prof. A. Milne-Edwards regards *F. tulliana* as a distinct species<sup>4</sup>. We regret that we did not ourselves examine the specimen when we were last in Paris; but on finding that the Leopards obtained by Danford on his second expedition were undoubtedly referable to *F. pardus*, we have been led to a more careful comparison of M. Milne-Edwards's detailed description with M. de Tchihatcheff's plate<sup>5</sup>. This examination leaves no doubt on our minds that Valenciennes's specimen is perfectly distinct from *F. uncia*; and we believe that it is really nothing but an unusually pale and long-haired variety of *F. pardus*, somewhat similar to the remarkable Persian Leopards now living in the Society's Gardens<sup>6</sup>. We therefore greatly regret that we should have been led to endorse the existence in Asia Minor of the true Ounce—an animal whose range is probably entirely confined to the most elevated regions of Central Asia<sup>7</sup>.]

5. \*†FELIS PARDUS, Linn. *Kaplan*.

As already stated the only Leopards obtained by Danford belonged to this species; the specimens he preserved present considerable variety in coloration and in proportional length of tail, but not greater than has been observed in other localities. Though nowhere common, the *Kaplan* appears to be generally distributed throughout

<sup>1</sup> P. Z. S. 1863, p. 183.<sup>2</sup> *Op. cit.* 1867, p. 262.<sup>3</sup> Monogr. Felidae, pt. 2.<sup>4</sup> Recherches Hist. Nat. Mamm. p. 214.<sup>5</sup> Asie Mineure, 2<sup>m</sup>e partie, Zool. pl. i.<sup>6</sup> Cf. P. Z. S. 1878, p. 289.

<sup>7</sup> Since the above went to press we have received a letter from M. Milne-Edwards, in which he says "Le *Felis tulliana*, par les proportions de ses membres, se rapproche beaucoup plus des Panthères véritables que des Onces; les taches de la robe sont plus grandes et plus annulaires, mais elles sont plus nombreuses que chez l'Ounce. Je suis persuadé que le *Felis tulliana* est une espèce, ou au moins une race fortement caractérisée, du Panthère." Impressed as we are with the great variability shown by many other of the Asia-Minor Mammals, we are still of the opinion expressed above.

the south and south-western mountains near the coast. An adult female specimen, the skeleton of which is now in the British Museum, was procured in the Giaour Dagh near Osmanieh on the 20th Jan.; it measured in the flesh :—

	inches.
Length of head and body .....	59
Length of tail .....	37
Height at shoulder .....	26

6. \**FELIS CATUS*, Linn. *Yaban-keci*. D. & A., no. 5.

A Wild Cat from the mountains near Marash is strikingly different from the Zebil specimens described in our previous paper. Instead of being of an unusually clear grey ground-colour, marked with distinct dark spots, the present example is very tawny in general tint, faintly but regularly brindled with a darker rufous-grey. There is a distinct black stripe along the upper surface of the tail, the rings of which are imperfect and interrupted, excepting those near the tip. The Asia-Minor Wild Cats would thus appear to be much more variable in coloration than any European specimens which we have examined.

7. \*†*FELIS CHAUS*, Güld.

This species appears to be tolerably common near Marash, where it inhabits the marshy districts known as the Plain of Bazardjik; skins from this locality do not appear to differ in any way from North-African specimens. The Booted Cat is also found in Southern Persia and in Palestine.

8. \**FELIS LYNX*, Linn. D. & A., p. 272.

In our first paper we introduced the *F. lynx* doubtfully, on the strength of a skin purchased in Constantinople. Last year Danford obtained a very fine specimen from the mountains near Albistan, thus proving that the ranges of the Northern and South-European Lynxes meet in Asia Minor. The Albistan skin differs much from the Constantinople one, which was only obscurely spotted. Its ground-colour above is a beautiful silvery rufous, the longer hairs being largely tipped with white; and it is marked with numerous jet-black spots, which are linear in shape on the back and rounded on the flanks; on the thighs the spots show an inclination to group themselves into rosettes, like those of the Leopard.

9. \**FELIS PARDINA*, Temm. *Ushek*. D. & A., no. 6.

10. \**FELIS CARACAL*, Linn. *Kara-koulak*. D. & A., no. 7.

[\*†*FELIS JUBATA*, Schreb.

A skin of the Cheetah was presented to Danford at Biledjik, on the Euphrates, by his host Sheik Mustapha, who stated that the animal had been killed among the rocks near Sevi, a small village about five hours down the river on the Mesopotamian side; it was the only specimen which he had ever seen. This Society has received

more than one specimen from Syria, and it is not improbable that the species may be found in some parts of Asia Minor proper. Sheik Mustapha also informed him that five years ago a Lion appeared near Biledjik, and after destroying many horses was done to death.]

11. \**HYÆNA STRIATA*, Zimm. *Zyrtlan*. D. & A., no. 8.

Not rare in the Euphrates valley, near Biledjik, where the natives assert that it understands Arabic and may be taken in the following way:—A man crawls into its den with a noosed rope, and stroking the Hyæna, caressingly says, "You are very nice and pretty and quite like a Lion, indeed you are a Lion." This so flatters the Hyæna that he allows the rope to be put round his neck, and is forthwith dragged out.

- [*GENETTA VULGARIS*, Less. D. & A., p. 273.

No further evidence of the supposed occurrence of the Gennet was obtained.]

12. \**HERPESTES ICHNEUMON* (Linn.). *Yer kiopek*. D. & A., no. 9.

Ichneumons were very common in the Pyramus valley.

13. \**CANIS LUPUS*, Linn. *Kurt, Fanovar*. D. & A., no. 10.

Wolves were seen in the Anti-Taurus.

14. \**CANIS AUREUS*, Linn. *Schakal*. D. & A., no. 11.

Jackals were very abundant at Adana.

15. \**CANIS VULPES*, Linn. *Telki*. D. & A., no. 12.

In our previous communication we doubtfully identified an imperfect skin of a Fox as representing a pale long-haired race of *C. vulpes*. A second specimen, from Marash, is darker, and redder above and rather whiter below; the brush has a rudimentary white "tag;" and the fore legs are blackish, with hardly a trace of rufous. The size is small; but, the skull and long bones being unfortunately wanting, we cannot give measurements. After careful comparison we can find no characters by which it can be separated from some South-European specimens of *C. vulpes*.

16. \**MELES TAXUS* (Schreb.). *Porsook*. D. & A., no. 13.

[*ICTONYX ZORILLA* (Thunb.). D. & A., p. 274.

As on his former expedition, Danford did not meet with the Zorille.]

17. \**MARTES FOINA* (Erxl.). *Samsar*. D. & A., no. 14.

Appears to be very common on the hills near Marash, as a great number of fine skins are exposed in the bazaar. Among these no examples of *M. sylvatica* were observed.

18. \**MUSTELA VULGARIS*, Erxl. D. & A., no. 15.

19. †*MUSTELA SARMATICA*, Pall. D. & A., p. 275.

Of this species, which we formerly introduced doubtfully on the

authorities of Ainsworth and Kotschy, skins were seen in the bazaar at Marash which came from Zeitoun, where they are said to be numerous and very destructive to the orchards.

20. \**LUTRA VULGARIS*, Erxl. *Su-itti, Kundush*. D. & A., no. 16.

21. \**URSUS ARCTOS*, Linn. *Aiyee*. D. & A., no. 17.

22. *URSUS SYRIACUS*, Ehrenb. *Aiyee*. D. & A., no. 18.

[*PHOGA*, sp.? D. & A., p. 275.]

23. \**SUS SCROFA*, Linn. *Domooz, Yaban-domooz*. D. & A., no. 19.

24. \**CERVUS ELAPHUS*, Linn. *Süyün*. D. & A., no. 20.

We are inclined to think that the Red Deer does not now exist in the Taurus proper; but it still lingers in the Anti-Taurus, where, however, it is fast dying out, perhaps owing to the advent of great numbers of Circassians. Large heads of recently-killed animals were brought to Danford, and he was well assured of their present existence. These wild and thinly-populated mountains, abounding in high grassy meadows and forests of juniper and other trees, are well fitted to be the last refuge of the Red Deer of these regions. In the northern districts of Asia Minor *C. elaphus* is much commoner; and we believe that it is found throughout the whole range of wooded hills bordering the Black Sea and the west coast at least as far as Broussa, where Danford was shown skins which indicated the great size which this animal attains in the forests of Olympus. All the heads which we have seen from the Anti-Taurus are peculiar in having the brow and bay tines united at the base, and appearing like the bifurcation of one branch.

[At the village of Jarpuz, at the foot of the Bimboghas Mountains near Albistan, Danford obtained from a peasant a very remarkable Deer's antler, in either a subfossil or a greatly weathered condition; and he saw another similar specimen in the same locality. When he exhibited this antler at a meeting of the Society last year<sup>1</sup> there was some difference of opinion as to whether it was or was not an abnormal specimen of *Cervus elaphus*; but as we are ourselves strongly of opinion that it cannot be referred to any known recent Deer, we reserve its description for another opportunity.]

25. \**CERVUS DAMA*, Linn. *Yamoorchä*. D. & A., no. 21.

In the central pine-wooded districts of Rhodes wild Fallow Deer are not uncommon; but the animals appear to be rather small, as might be expected from their insulated range. The following are the measurements of a buck, of about four years old, killed at Laerma in Rhodes on the 22nd December, 1878:—

	inches.
Length of head and body .....	48·00
„ tail, with hair .....	14·00
„ caudal vertebræ .....	9·00

<sup>1</sup> P. Z. S. 1879, p. 552.

	inches.
Length of head .....	12.50
„ ear .....	6.50
„ of antlers along curve .....	18.50
Span of antlers .....	16.00

The general colour of this specimen was a dark greyish brown above with a darker line running along the back; the legs were fawn-coloured, and the belly pure white.

Both in Rhodes and on the mainland the wild Fallow Deer show but faint traces of the white spots which are so characteristic of the park breed. In the former locality the form of the antlers is very constant; but a series collected in the Giaour Dagħ are of very irregular shapes, extra points being commonly thrown out on the beam, and the pal-mation being very much less marked than in the normal type.

26. \*CAPREOLUS CAPRÆA, Gray. *Karadja*. D. & A., no. 22.

Appears to be very rare in the south, though occurring in the Giaour Dagħ and in the neighbouring portions of the Taurus range.

27. \*GAZELLA DORCAS (Linn.) *Jairan*. D & A., no. 23.

Common all along the valley of the Pyramus, on the Plain of Bazardjik, the stony oak-wooded uplands on the right bank of the Euphrates, and in many other localities. Another Gazelle, which was reported to Danford as being found on the banks of the latter river, will probably prove to be *G. subgutturosa*.

28. \*CAPRA ÆGAGRUS, Gmel. *Kayek*. D. & A., no. 24.

29. \*OVIS GMELINI, Blyth. *Kotch, Yaban-köyun*. D. & A., no. 25.

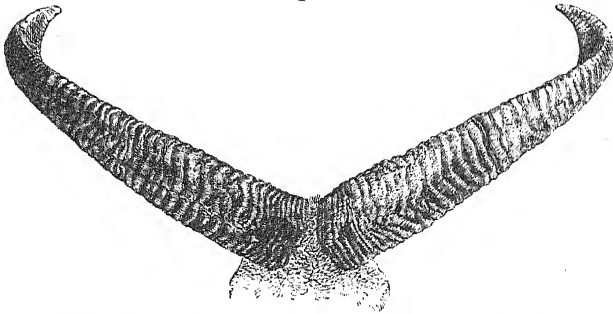
Dr. Alexander Strauch, Director of the Zoological Museum of the Imperial Academy of St. Petersburg, visited London in 1878, principally to examine the specimens of the genus *Ovis* in the British Museum, a group which he has made a special object of study. He was much struck with the form of the horns of a Cilician Wild Sheep's skeleton, obtained by Danford on his first expedition, and identified by us as *O. gmelini*. These horns Dr. Strauch considered to be so peculiar as to indicate specific distinction from both the Armenian *O. gmelini* and the Cyprian *O. ophion*; and, at his suggestion, we have been led to reconsider the question of its identity.

On comparing the horns of the skeleton in question, that of an adolescent male (figs. 3, 6), with those of the types of Blyth's *O. gmelini*, also in the national collection (figs. 1, 4), the differences are, indeed, so striking that it is difficult to believe that the animals can belong to the same species. In the Cilician Sheep the terminal portion of the horns are bent boldly upwards, so that their curves strongly resemble those of *O. ophion*. Their sculpture is large but ill-defined, the fronto-nuchal and fronto-orbital edges<sup>1</sup> are well marked but rounded; and both the orbital and nuchal surfaces are flat at the base and then slightly *concave*.

<sup>1</sup> We employ these terms as defined by Sir Victor and Mr. Basil Brooke, P. Z. S. 1875, p. 511.

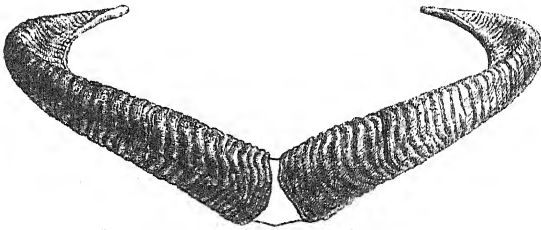


Fig. 1.



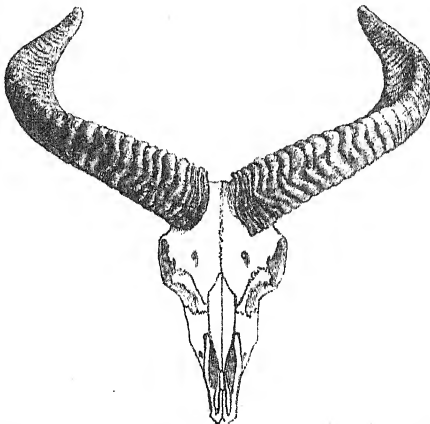
*Ovis gmelini*, from Erzerum (specimen *b* in list); front view.

Fig. 2.



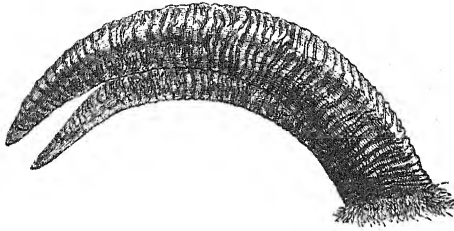
*Ovis gmelini*, from the Cilician Taurus (specimen *c* in list); front view.

Fig. 3.



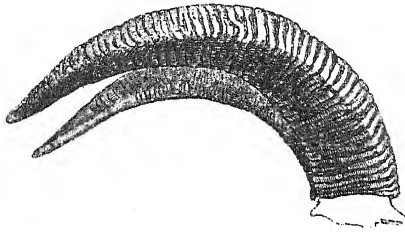
*Ovis gmelini*, from the Cilician Taurus (specimen *e* in list); front view.

Fig. 4.



*Ovis gmelini*, from Erzerroom (specimen *b* in list); side view.

Fig. 5.



*Ovis gmelini*, from the Cilician Taurus (specimen *c* in list); side view.

Fig. 6.



*Ovis gmelini*, from the Cilician Taurus (specimen *e* in list); side view.

But on examining two other pairs of horns from the same locality, in Danford's own collection, we find that they do not present the peculiarities of the British-Museum skeleton, but agree excellently with Blyth's type. In these horns (one pair of which are represented in figs. 2, 5) the terminal portion is only gently bent upwards, the sculpture is small and sharp, the fronto-orbital edge is not distinct, except at the base, and the orbital surface is strongly *convex* throughout, so that towards the middle of the horn it runs almost insensibly into the frontal surface.

As it is hardly possible that two closely allied species should be found together on the Cilician Taurus, the above comparisons appear to us to be of some importance, as illustrating the wide range of variation in the form of the horns in one species of Wild Sheep, and the consequent necessity of examining a large series of specimens of such animals before deciding as to their specific identity. When such series are available from different localities, we suspect that some of the recently described new species will prove to have been founded on individual varieties. With a view to contributing to such material, we have had the accompanying figures prepared, and have drawn up the following list of the specimens examined, with a table of their principal measurements.

a. An enormous head in the British Museum, presented by Mr. W. Burckhart Barker, and said to be from "an island in the Mediterranean" (!).

b. Skin with horns. Erzeroum, Dickson and Ross, in the British Museum. One of the types of Blyth's *O. gmelini*, the others being a ewe and a lamb (figs. 1, 4, pp. 56, 57).

c. Horns, Cilician Taurus, in Danford's collection (figs. 2, 5, pp. 56, 57).

d. Horns, Cilician Taurus, in Danford's collection.

e. Skeleton, Cilician Taurus, Danford, in British Museum (figs. 3, 6, pp. 56, 57).

MEASUREMENTS.	a.	b.	c.	d.	e.
	in.	in.	in.	in.	in.
Length of horn along curve of fronto-nuchal edge .....	40.25	21.40	26.10	24.40	18.50
Circumference at base .....	10.30	10.25	8.60	10.00	8.60
Circumference at one half of length ...	9.20	8.15	7.50	7.90	6.30
Breadth of horns at widest portion, in a straight line .....	25.00	23.80	22.40	21.00	17.00
Distance from tip to tip, in a straight line .....	5.30	21.00	12.20	12.80	11.00

We have given a description of the colour &c. of Danford's Cilician examples in our former paper; the typical skins of Blyth agree perfectly with them. The males in both cases have no white saddle-mark; and the females are hornless.

Dr. Strauch informs us that the original type specimen of *S. G.*

Gmelin's "Orientalische Schaaf"<sup>1</sup> is still preserved in the St.-Petersburg Museum. In his opinion it is quite distinct from *O. gmelini*, but agrees with specimens received from North Persia. According to this view (as to which we have no material to found a personal opinion upon), the synonymy of the Asia-Minor and Cyprian Wild Sheep would appear to be as follows:—

#### OVIS GMELINI.

*Ovis gmelini*, Blyth, P. Z. S. 1840, pp. 69, 78 (descr. orig.); ejusd. Journ. As. Soc. Beng. x. pt. 2, p. 886; Fraser, Zool. Typ. pl. xxi. [Based on the Erzerroom specimens now in the British Museum; but Gmelin's "Orientalische Schaaf" is regarded as identical.]

*Ovis anatolica*, Valenciennes, Rev. et Mag. Zool. 1856, p. 346 (descr. orig.); ejusd. Compt. Rend. Ac. Paris, xliii. p. 56; de Tschihatcheff, As. Mineure, 2<sup>me</sup> p<sup>tie</sup> p. 727, pl. iv.

*Hab.* Erzerroom (*Dickson & Ross, Mus. Brit.*); Bulgar Daghs (*Tschihatcheff, Mus. Par.*); Cilician Taurus (*Danford, Mus. Brit.*).

#### OVIS OPHION.

*Ovis musimon*, var.  $\beta$ , *orientalis*, Brandt & Ratzeburg, Mediz. Zool. i. p. 54, pl. ix. figs. 1 & A (descr. orig., 1828, nec Schreber).

*Ovis ophion*, Blyth, P. Z. S. 1840, pp. 73, 78 (ex Brandt & Ratz.); ejusd. Journ. As. Soc. Beng. x. pt. 2, p. 887.

*Ovis cyprius*, Blasius, Säugeth. Deutschl. p. 473, figs. 251, 252 (ex Br. & Ratz.).

*Hab.* Cyprus (*v. Sack, Mus. Berol.*).

We may remark that our national collection does not yet possess a specimen of this latter Wild Sheep, which is supposed to be peculiar to our "youngest dependency."

30. \*SCIURUS SYRIACUS, Hemp. & Ehr. *Dereek, Kallay*. D. & A., no. 26.

31. \*SPERMOPHILUS XANTHOPRYMNUS (Benn.). *Arab-tauochan*. D. & A., no. 27.

Many more specimens were obtained of this little-known Souslik, which was fully described in our first paper; those which were preserved show a remarkable uniformity both in proportions and coloration. The species swarms over the whole barren district of the interior, from Kaisariyeh to Eski-Shehir. A Souslik from Ok Meidan, in European Turkey, obtained through the late Mr. Pearce of Constantinople, proves to be *S. citellus* (Linn.); probably the Bosphorus is the limit between the ranges of the two species. Other animals, apparently belonging to this genus, were observed on the banks of the river Sakaria (Sangarius); these were grey in colour, with pale-yellow breasts, but unfortunately no specimens were procured.

<sup>1</sup> Reise d. Russl., iii. p. 486, pl. lv.; = *Ægoceros musimon*, Pallas, Zoogr. Ross. As. i. p. 230, pl. xix. fig. 7 (part. nec Schreber); = *Ovis orientalis*, Keyserling & Blasius, Wirbelth. Europ. pp. v, 29 (part., 1840), Blasius, Säugeth. Deutschl. p. 472, figs. 249, 250.

[*ARCTOMYS*, sp.? D. & A., p. 278.

Danford again failed to obtain any species of true Marmot, either in the Taurus, where Ainsworth asserts their existence, or elsewhere.]

[†*CASTOR FIBER*, Linn.

Very trustworthy authorities at Kaisariyeh told Danford that in the marshes between that place and Indjesu there existed an animal like an Otter, but which had a broad hairless tail. This description points pretty directly to the Beaver, an animal which still exists in the Euphrates near Aleppo<sup>1</sup>, and in the rivers of the Caucasus<sup>2</sup>. The species is included in Smarda's list of the Mammals of Mesopotamia<sup>3</sup>, and, though "with some doubt," in Mr. Blanford's Fauna of Persia<sup>4</sup>.]

32. \**MYOXUS DRYAS* (Schreb.). D. & A., no. 28.

33. \*†*GERBILLUS ERYTHRURUS*, Gray.

A Gerbille was obtained from the stony hill-sides at Kaisariyeh, where the species is reported to be common. It agrees with Gray's types (though not with his description<sup>5</sup>) and with Major St. John's South-Persian specimens<sup>6</sup>, now in the British Museum, in all essentials, but is of a darker and richer rufous above; the lower parts are strongly tinged with yellow; and the elongated hairs on the upper surface of the tip of the tail are rather brown than blackish. The measurements of this specimen, an adult male preserved in spirits, are as follows :—

	inches.
Length of head and body.....	5·25
„ tail .....	5·75
„ ear .....	·70
„ hind foot .....	1·35

The skull is unfortunately much shattered; and the molars are so worn that their pattern is somewhat indistinct. We do not feel any doubt, however, of the identity of the specimen with this species, whose range appears to extend from Afghanistan, through Southern Persia, to Asia Minor.

34. *CRICETUS FRUMENTARIUS*, Pall. D. & A., no. 33.

35. \**CRICETUS NIGRICANS*, Brandt. D. & A., no. 34.

[? *CRICETUS ACCEDULA* (Pall.). D. & A., no. 35.

In our first list we introduced this species on the faith of the report on one of Dickson and Ross's collections from Erzeroum, where the house-haunting Hamster of Asia Minor is identified as *C. accedula*<sup>7</sup>. The examination of a large series now proves, however, that

<sup>1</sup> Travels of Dr. and Mme. Helfer (English ed., 1879), i. p. 221.

<sup>2</sup> Eichwald, Nouv. Mém. Soc. Nat. Mosc. vii. p. 36.

<sup>3</sup> Geogr. Verbr. der Thiere, p. 408.

<sup>4</sup> East. Persia, ii. p. 51.

<sup>5</sup> Ann. Mag. Nat. Hist. x. p. 266 (1842, descr. orig.).

<sup>6</sup> Cf. Blanford, East. Persia, ii. p. 70.

<sup>7</sup> P.Z. S. 1839, p. 122.

it is referable to the next species; and there appears to be no other evidence of the occurrence of *C. accedula* in Asia Minor.]

36. \*†*CRICETUS PHÆUS*, Pall. *Kara-guz*.

Abundant in houses at Kaisariyeh. Those caught generally had their pouches stuffed with dry pigeon-droppings. It was remarkable that none of these Hamsters ventured into Danford's traps until the house had been cleared of Mice; apparently the latter, in spite of their smaller size, have the upper hand in the murine polity.

[*MUS RATTUS*, Linn. D. & A., p. 279.]

37. *MUS DECUMANUS*, Pall. D. & A., no. 29.

[*MUS ABBOTTI*, Waterh.

Under this name Mr. Waterhouse described a Mouse sent many years ago to this Society from Trebizond by Mr. Keith E. Abbott<sup>1</sup>. His type is not to be found in that portion of the Society's collection which passed to the British Museum; and we can only direct the attention of collectors to his original description. The animal is stated to have been smaller than a Harvest-Mouse (length of head and body 1 inch 3 lines, of tail 1 inch 11 lines), and of a deeper colour than *Mus musculus*. Had the description been given by any less trustworthy writer, we should have had little hesitation in regarding it as having been founded on a young individual of that species.]

38. \**MUS MUSCULUS*, Linn. *Sytchan*. D. & A., no. 30.

Specimens of the common House-Mouse were obtained in various towns and villages, including Oroul, near the Euphrates, where the range of this species overlaps that of *M. bactrianus*. These vary considerably in size and in intensity of colour—some, like the example mentioned in our first paper, being very pale in tint, while others are small and usually dark. Two House-Mice from a village in the Giaour-Dagh are so peculiar in coloration that at first sight they appear to belong to quite a distinct species, their upper parts being of a light fawn which passes insensibly into the still paler and more yellowish fawn of the belly. But we can find no structural differences whatever; and an English variety of *M. musculus* almost identical in tint is preserved in the British Museum.

39. \*†*MUS BACTRIANUS*, Blyth.

Of this species, which is probably, as Mr. Blanford remarks, "the House-Mouse of the extreme north-west of India, Kashmir, Afghanistan, Baluchistan, and Southern Persia," specimens were trapped at Oroul, on the Euphrates, along with *M. musculus*, thus showing that its range extends considerably further west than has hitherto been supposed. Two examples which were preserved agree well with Mr. Blanford's excellent description and figure<sup>2</sup>, and with his Persian specimens in the British Museum, only differing in having slightly shorter tails. Measurements (in spirits):—

<sup>1</sup> P. Z. S. 1837, p. 77.

<sup>2</sup> East. Persia, ii. pp. 56, 57, pl. v. fig. 2.

	inches.	inches.
Length of head and body . . . .	3.50	3.00
„ tail . . . . .	2.70	2.63
„ ear . . . . .	.50	.45
„ hind foot . . . . .	.70	.64

Dr. Severtzoff named the House-Mouse of Turkestan "*Mus wagneri*  $\beta$ . *major* (*M. tomak*?, n. sp.?)"<sup>1</sup> without describing it; and Mr. Blanford has separated the form found in the east of the same country as *M. pachycercus*<sup>2</sup>; both of these, if distinct, are certainly closely allied to *M. bactrianus*.

40. \**MUS SYLVATICUS*, Linn. *Yaban-sytchan*. D. & A., no. 31.

41. \**MUS MYSTACINUS*, Danf. & Alst. *Dagh-sytchan*. D. & A., no. 32.

Danford did not meet with this Mouse on his last expedition, not having been able to collect in any suitable localities.

42. †*ARVICOLA SOCIALIS*, Pall.

To this species we are inclined to refer two small Voles which were sent by Messrs. Dickson and Ross from Erzeroom to this Society, and which are now in the British Museum: they agree well both in dentition and proportions with Keyserling and Blasius's subgeneric and specific diagnoses<sup>3</sup>, and fairly with Schreber's description<sup>4</sup>, although their tails can hardly be said to be white. The *Arvicola* of Western Asia and Eastern Europe are so little known, either from well-preserved specimens or accurate descriptions, that it is at present impossible to clear up the relationship between *A. socialis* and some other nominal species, such as *A. micrurus* (S. G. Gm.), *A. mystacinus*, Ménériés, and *A. syriacus* (Licht.). But when we remember the variability of the better-known European and American Voles, it appears not unlikely that these will prove to be merely races or varieties of Pallas's species.

43. \*†*ARVICOLA GUENTHERI*, sp. n. (Plate V.)

?*Arvicola leucura*, Severtzoff, Turkest. Jevotnie, p. 82 (1873, descr. orig., nec Gerbe).

It is not with a light heart that we venture to add to the long list of described species of *Arvicola*; but two specimens of a Vole, which Danford found abundantly in the marshes below Marash, present such striking characters that no choice is left to us. The following is a detailed description of the animal, which belongs to Blasius's subgenus *Arvicola* proper, characterized by the first lower molar having *nine* and the second upper molar *four* cemental prisms<sup>5</sup>.

<sup>1</sup> Turkestanskie Jevotnie, pp. 61, 82; Ann. & Mag. Nat. Hist. (4th ser.) xviii. p. 53. *M. wagneri*, Eversmann (Bull. Soc. Imp. Moscou, xxi. 1<sup>re</sup> partie, p. 191), is usually considered to be a synonym of *M. minutus*, Pall.

<sup>2</sup> J. As. Soc. Beng. xliv. pt. 2, p. 108; 2nd Yarkand Mission, Manum. p. 53, pl. ix. fig. 2, pl. x.b. fig. 4.

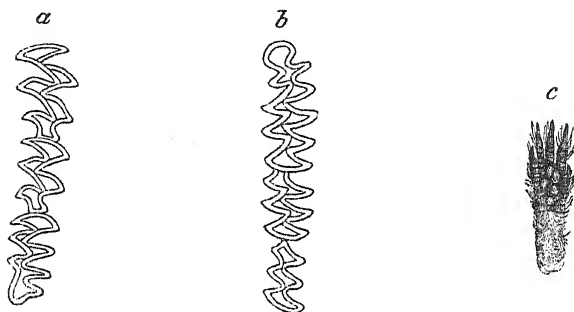
<sup>3</sup> Wirbelth. Eur. pp. 33, 34.

<sup>5</sup> Säugth. Deutschl. p. 374.

<sup>4</sup> Säugth. iv. p. 682.

Ears moderate, well haired towards their margin, showing distinctly above the fur. Tail hardly longer than the hind foot, and a little more than one fifth the length of the head and body. Soles densely haired almost to the roots of the toes; fore feet with five tubercles, arranged three and two, besides the very small rudimentary thumb, which has no nail; hind feet with five tubercles closely set, and arranged two, two, and one (fig. 7, *c*).

Fig. 7.

*Arvicola guentheri*.

*a*, upper molars; *b*, lower molars (magnified six diameters);  
*c*, sole of hind foot (natural size).

Teeth very similar to those of *A. arvalis*, the molar pattern being:—

Upper I.	5	prisms,	6	angles.	Lower I.	9	prisms,	9	angles.
„ II.	4	„	5	„	„ II.	5	„	6	„
„ III.	6	„	7	„	„ III.	3	„	3	„

But the posterior prisms of the first and second upper molars are dilated behind, and that of the third is produced behind its internal projection. The first three prisms of the first lower molar are imperfectly separated (fig. 7, *a*, *b*).

Upper parts yellowish mouse-grey, the tips of the hairs being either light fawn or black; on the flanks this colour passes insensibly into the greyish white of the lower parts, which is slightly washed with yellow on the belly. Feet greyish white. Tail rather thinly clad with short white hairs; these are mixed on its upper surface with dusky hairs, which are most conspicuous near the point. Measurements (in spirits):—

	inches.	inches.
Length of head and body . . . .	4.00	4.25
„ tail . . . . .	.82	.77
„ ear . . . . .	.40	.42
„ hind foot . . . . .	.75	.75



This Vole differs from all others with which we are acquainted in the extreme shortness and peculiar colouring of the tail, and in the density of the hairiness of the soles. It would appear to be most nearly allied to *A. arvalis*, from which it is at once distinguishable by its proportions and by the number of plantar tubercles. In general appearance it bears a strong resemblance to *A. stoliczkanus*, Blanford, from Yarkand; but that animal has not only a wholly yellowish-white tail, but belongs probably to the subgenus *Paludicola*, Blasius, the first lower molar having only *seven* cemental prisms<sup>1</sup>. It seems not at all improbable, on the other hand, that our animal may be identical with the *A. leucura* of Dr. Severtzoff; his diagnosis is not impertinent, although he says that the tail is one fourth the length of the body, and white with a black tip<sup>2</sup>. But in any case his name cannot stand, being preoccupied by the *A. leucurus* of Gerbe<sup>3</sup>, which Blasius and Fatio have united with the *A. nivalis* of Martins. We therefore propose to name our species in honour of our friend Dr. Günther.

44. \**SPALAX TYPHLUS*, Pall. *Kior-sytchan*. D. & A., no. 36.

[*ALACTAGA DECUMANA* (Licht.). D. & A., p. 281.

The "Jerboa" of Herr Kotschy and Mr. Curzon, which we thought probably referable to this species, may have been *Gerbillus erythrurus*.]

45. \**HYSTRIX CRISTATUS*, Linn. *Kipri*. D. & A., no. 37.

[*LEPUS SYRIACUS*, Hemp. & Ehrenb. D. & A., no. 38.

As will be seen below, we believe we were in error in the determination of the Asia-Minor Hare].

46. \*†*LEPUS EUROPEUS*, Pall. *Tauochan*.

In our former notes we somewhat doubtfully identified two Hares shot in the Taurus with the *L. syriacus* of Hemprich and Ehrenberg; but on examining more specimens, we find them to agree best with the East-European form named *L. caspicus* by the same writers. We cannot find any characters, however, which would justify the specific separation of that race from the Common Hare; and we therefore follow Blasius in regarding it as a climatic variety of *L. europæus*.

<sup>1</sup> Blanford, J. As. Soc. Beng. xlv. pt. 2, p. 107 (1875, descr. orig.); Second Yarkand Mission, Mamm. p. 42, pl. viii. fig. 1, pl. x. b. fig. 2.

<sup>2</sup> Turk. Jevot. p. 82; Ann. & Mag. N. H. (ser. 4), xviii. p. 52.

<sup>3</sup> Rev. Zool. 1852, p. 260 (descr. orig.).

received at the British Museum from the Brazils under the name of *Cynalicus melanogaster*. It may here be noticed that the reference by the same author<sup>1</sup> of *Canis brachyotus*, of which the skull and teeth are figured by Blainville ('Ostéographie,' gen. *Canis*, pls. viii. & xii.) to this species, is incorrect; but Van der Hoeven has given a good figure of the same parts<sup>2</sup>. Very recently Cope has described (without figure) an extinct species from Oregon, which he refers to this group, under the name of *Icticyon crassivultus*<sup>3</sup>.

In consequence of the dental formula, and some superficial resemblance in external form, this animal has often been placed by systematists among the Mustelidæ; but its true position as a dog has been recognized by all who have closely investigated its structure. The living specimen much recalled in appearance a young Fox, and had the manners of a playful puppy. It was a female, and at the time of death nearly adult. All the permanent teeth were in place; but the canines were not fully protruded, and the epiphyses were not united to the ends of the long bones.

The only decided character by which it has been separated generically from *Canis*, besides the shortness and broadness of the skull, is the reduction in development of the true molar teeth. In the upper jaw the posterior molar of *Canis* ( $\frac{m.2}{10}$ ) is stated to be absent, and  $\frac{m.1}{1}$  is smaller and simpler than in the Dogs generally. In the lower jaw, whereas *Canis* has usually three true molars, *Icticyon* has but two; and the last which is developed is considerably smaller than its homologue in the ordinary forms. This appears to have been the case in all the specimens hitherto examined; but the present example presents an interesting variation, as, in addition to the teeth usually described as being present, it has a pair of very small tubercular molars above, the crowns of which are divided into an outer and an inner cusp. The dental formula, therefore, is  $i. \frac{3}{3}, c. \frac{1}{1}, pm. \frac{4}{4}, m. \frac{2}{2} = \frac{10}{10} = 40$ , corresponding with that of *Canis primævus* of Bengal, constituting the genus *Cuon* of Hodgson, to which animal *Icticyon* comes nearer, in the general form of the skull, than to any other of the group. The presence of these small teeth may be an individual peculiarity; or it may be that they are normally developed in the young animal, and are early deciduous, so that in the older specimens previously examined they have escaped notice. In any case they show a most interesting transitional character, and point to the fact that, in the reduction of the molar teeth, *Icticyon* is modified from a more generalized canine type. Another slight peculiarity in the dentition is that the inner tubercle of the upper sectorial is placed rather further from the anterior edge of the tooth than in *Canis*.

<sup>1</sup> 'Catalogue of Carnivorous, Pachydermatous, and Edentate Mammalia in the British Museum,' by J. E. Gray, 1869, p. 183.

<sup>2</sup> J. Van der Hoeven, "Over het geslacht *Icticyon*," *Verhandelingen der Koninklijke Akademie van Wetenschappen*, 'Derde Deel (Amsterdam, 1856).

<sup>3</sup> E. Cope, "On the Genera of Felidæ and Canidæ," *Proc. Acad. Nat. Sciences Philadelphia*, July 8th, 1879.

The length of the animal, from the tip of the nose to the end of the tail, was  $25\frac{1}{2}$  inches, of which the head measured  $5\frac{1}{2}$  inches, the neck and trunk  $15\frac{1}{2}$ , and the tail  $4\frac{1}{2}$  inches.

There are four pairs of mammæ, situated nearly equidistant on the ventral surface: the anterior pair over the ribs, nearly 2 inches behind the elbows; the second pair on the abdomen, slightly in front of the umbilicus; the third pair opposite the knee-joint; the last pair 2 inches in front of the vulva.

The relative length of the toes and form of the palmar and planar pads can be best understood by a reference to the accompanying figures (figs. 1 and 2).

Fig. 1.

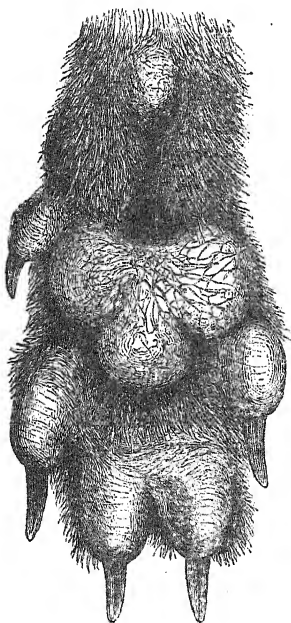


Fig. 2.

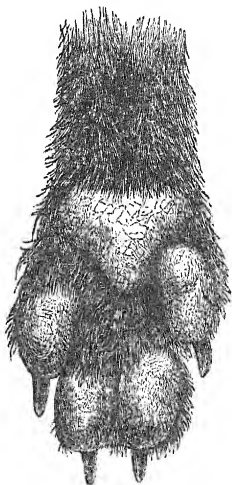


Fig. 1. Under surface of right fore foot of *Icticyon*; natural size.

Fig. 2. Under surface of right hind foot of *Icticyon*; natural size.

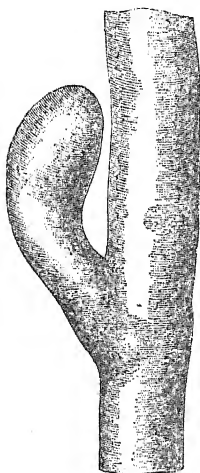
The tongue has a well-developed lytta and four small circumvalate papillæ on each side.

The stomach, as in the Dog, consists of a subglobular cardiac portion and a narrower pyloric portion, separated by a constriction. The small intestine measured 46 inches in length, and the large 10 inches. The only difference which the alimentary canal presents from the usual canine type is in the cæcum (fig. 3), which is very small,

only one inch and a half in length, slightly curved, and with a conical apex. This adds another to the list, given in the notice of the cæcum of the Red Wolf<sup>1</sup>, of Canidæ with small simple cæca. The liver (figs. 4 and 5) only differs from that of a small Terrier Dog<sup>2</sup> in a slight variation in the relative size of the lobes, perhaps not greater than would be met with in comparing this organ in a series of individuals of the same species.

The anal glands are large, oval, thin-walled sacs, with a muscular covering and smooth lining membrane, each .9 inch in length and

Fig. 3.



Cæcum of *Icticyon*; natural size.

.7 inch wide, and opening by a single orifice, large enough to admit a bristle, at the lateral margin of the anal aperture.

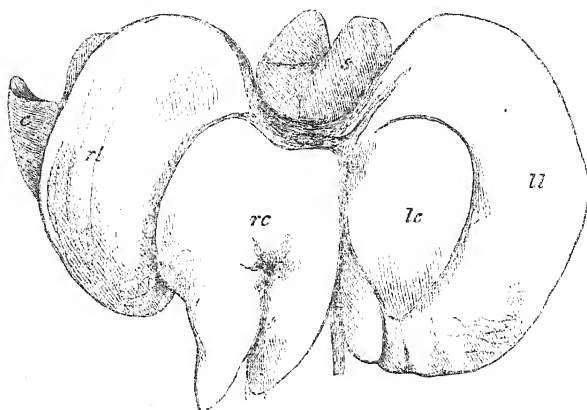
The brain (figs. 6 and 7, p. 75) is characteristically canine, except that, on the left side, the gyrus immediately surrounding the Sylvian fissure (fig. 6 *z'*, *z'*) is not marked off by a complete sulcus at its upper curved part from the one above it, and therefore almost reproduces the condition met with in the Felidæ, from which form, according to the view of the late Professor Garrod, the canine brain has been derived by complete division of the lower or external gyrus into an outer and inner segment<sup>3</sup>. Although I have no doubt, after examining a larger number of specimens than were available when attempting a classification and comparison of the cerebral convolutions of the

<sup>1</sup> See P. Z. S. 1879, p. 766.

<sup>2</sup> See "Lectures on the Comparative Anatomy of the Organs of Digestion in the Mammalia," 'Medical Times and Gazette,' June 1, 1872, p. 622, fig. 23.

<sup>3</sup> "Notes on the Visceral Anatomy of *Lycaon pictus* and of *Nyctereutes procyonides*," P. Z. S. 1878, p. 377.

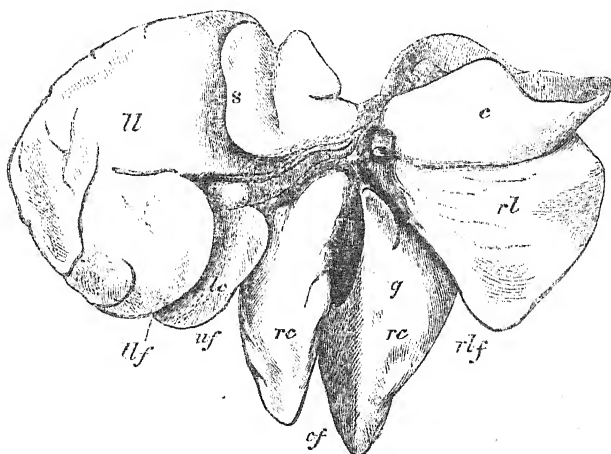
Fig. 4.



Upper surface of liver of *Icticyon*; half natural size.

*rl.* right lateral lobe; *rc.* right central lobe; *lc.* left central lobe; *ll.* left lateral lobe; *s.* Spigelian lobe; *c.* caudate lobe.

Fig. 5.

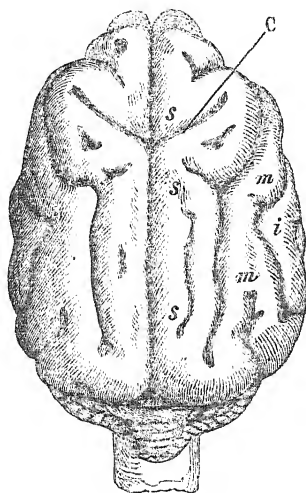


Under surface of liver of *Icticyon*; half natural size.

*uf.* umbilical fissure; *cf.* cystic fissure; *llf.* left lateral fissure; *rlf.* right lateral fissure; *ll.* left lateral lobe; *lc.* left central lobe; *rc.* right central lobe; *rl.* right lateral lobe; *s.* Spigelian lobe; *c.* caudate lobe; *g.* gall-bladder.

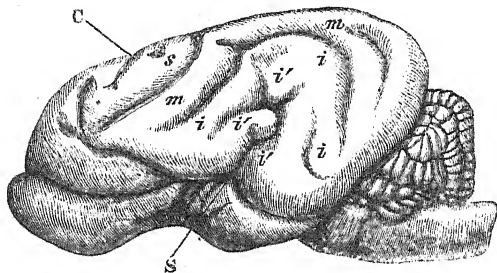
different groups of the Carnivora<sup>1</sup>, that the fourth (counting from the middle line) or inferior gyrus of the Dog is represented by the outer or inferior portion of the third (counting in the same way) of the

Fig. 6.

Upper surface of brain of *Icticyon*; natural size.

c. crucial sulcus; s, m, and i. superior, middle, and inferior lateral gyri.

Fig. 7.

Side view of brain of *Icticyon*; natural size.

S. Sylvian fissure; c. crucial sulcus; s. superior lateral gyrus; m. middle lateral gyrus; i. inferior lateral gyrus; i'. imperfect second inferior lateral gyrus, usually complete in the Canidae.

other Carnivora, and is in many *Æluroids* already partially marked off by an interrupted sulcus, I am not prepared on that account to accept the conclusion that the Dog is a further modification of

<sup>1</sup> See P. Z. S. 1869, p. 482.

highly specialized æluroid type. Very little else in the structure or the palæontological history of the Dog indicates that it has passed through a feline stage in its development; and its more complex brain may have been evolved quite independently from a primitive form. A comparative study of the development of the convolutions of the brain in the Dog and other Carnivora would throw light upon this subject.

2. On some Points in the Structure of *Nasiterna* bearing on its Affinities. By W. A. FORBES, B.A., F.L.S., Scholar of St. John's College, Cambridge, Prosector to the Society.

[Received February 12, 1880.]

For many years the true position in the series of Parrots of this very singular little form, of which about seven species are now known, has been a moot point amongst ornithologists, most authors placing it amongst the *Cacatuinæ*.

Although two accounts have been published of some points in the anatomy of *Nasiterna pusio*—first by Mr. Sclater when describing that species<sup>1</sup>, and secondly by Signor Camerano, in a paper read before the Turin Academy of Sciences<sup>2</sup>,—nothing very definite has resulted from them tending to elucidate this doubtful point. Mr. Sclater was inclined to regard it (*l.c.* p. 622) as “an aberrant form of the *Psittacinæ* . . . unless it can be allowed to stand as the type of a distinct subfamily, which would probably be more correct.”

At my request, some fifteen months ago, M. Alphonse Milne-Edwards was kind enough to forward to the late Prof. Garrod a specimen (in spirit) of a *Nasiterna*, probably *N. pygmæa*, for dissection; and I now place before the Society a few statements on its structure as recorded in his MS. notes.

As in all other Parrots, except in certain species of *Cacatua* and in *Licmetis tenuirostris*, there are two carotid arteries in *Nasiterna* (a fact previously recorded by Camerano), both of which run in the normal manner in the hypapophysial canal. As in all Parrots with the carotids so disposed (except some individuals of *Stringops*), the ambiens muscle is absent. The furcula is represented only by a rudiment at the upper end; and the orbital ring is incomplete. As the oil-gland is present, the formula for *Nasiterna*, adopting the system used by Prof. Garrod in his paper on the anatomy of the Parrots<sup>3</sup>, will be 2, —, —, +, as in *Agapornis*, *Stringops*, *Geopsittacus* and their allies.

Pterylographically, I have been able to ascertain that *Nasiterna pygmæa* agrees generally in the form and disposition of the tracts with such genera as *Cyclopsitta*, *Psittinus*, &c., and differs from the *Cacatuinæ* in the absence of the crest and naked head-space (*cf.*

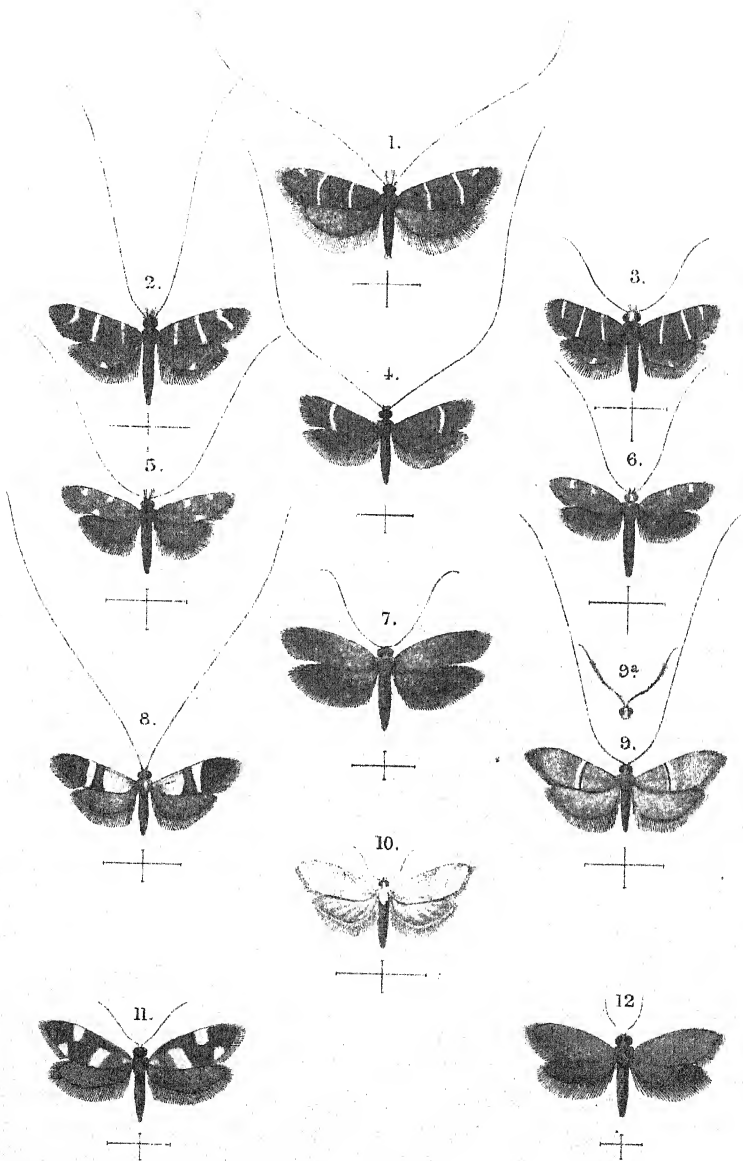
<sup>1</sup> P. Z. S. 1865, p. 620.

<sup>2</sup> Atti Reale Acad. Torin. xiii. 1878, p. 301.

<sup>3</sup> P. Z. S. 1874, p. 595.





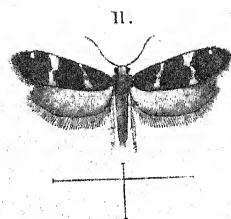
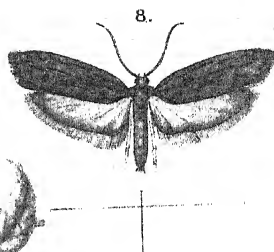
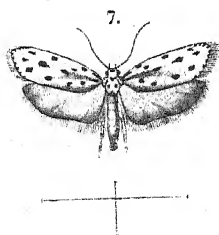
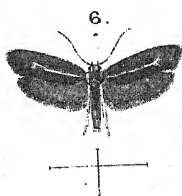
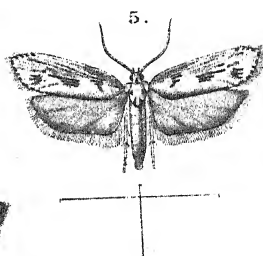
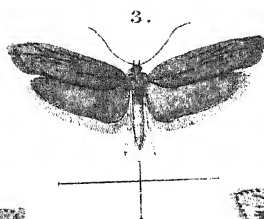
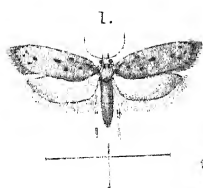


Erwin Wilson, del et lith.

NEW SPECIES OF TINEIDÆ.

Miner Bros, imp.





Edwin Wilson, del et lith

Mintern Bros. imp.

NEW SPECIES OF TINEIDÆ.

Slater, *l. c.* p. 622) universally present, as far as I have yet seen, in that group, as also in the absence of powder-down feathers, very frequently, though not invariably, present in those birds, though absent in the other *Psittaci* with "normal" carotids. In the Cockatoos, too, the orbit is completely encircled by bone<sup>1</sup>, and, as a rule, doubly so (*vide* P. Z. S. 1874, pl. lxxi.). In *Nasiterna*, as already stated, it is not so. Of the other "*Palæornithidæ*," as defined by Prof. Garrod, the *Trichoglossinæ* form a well-marked group, characterized by numerous features to which there is no approach in *Nasiterna*.

Its nearest allies must therefore be in the remaining forms of that family, which I propose to call *Eclectinæ*, including all those not either Cacatuine or Trichoglossine, with the exception, perhaps, of the ground-frequenting forms, *Stringops*, *Pezoporus*, &c. The spiny tail-feathers of *Nasiterna* are, no doubt, very peculiar, and with its curious beak and diminutive size must always make this a very well-marked genus. But I fail to see in its spiny tail sufficient importance to elevate *Nasiterna* into a special subfamily, as suggested by Mr. Slater. *Chætura* is not separated on similar grounds from the other *Chæturinæ*; nor has the spatulate tail of *Prioniturus* been advanced as entitling that genus to form a special subfamily.

The anatomy of the small short-tailed genera *Cyclopsitta*, *Psittacella*, &c. is as yet unknown; but I believe that it is amongst these forms—related, as far as can be judged from external appearance, through this last to *Pezoporus*, *Geopsittacus*, &c.—that *Nasiterna* has its nearest allies. *Agapornis* and *Psittinus* are also not very distantly related, though I believe that the loss of its furcula by *Agapornis*, in which it resembles *Nasiterna*, is probably due to independent causes<sup>2</sup>. That the loss of the furcula is not exclusively correlated with terrestrial habits is shown by its absence in three such essentially arboreal genera as *Agapornis*, *Nasiterna*, and the Neotropical *Psittacula*.

### 3. On some new and little known Species of *Tineidæ*. By THOMAS, LORD WALSLINGHAM, F.Z.S.

[Received February 17, 1880.]

(Plates XI., XII.)

Genus *ADELA*, Latreille.

Mr. Walker in his 'Catalogue of Lepidoptera Heterocera in the British Museum,' part xxviii. p. 501, 1863, described three species of the genus *Adela*—*A. purpurea* and *A. bellula* from North America, and *A. albicornis* from Natal. The first of these (*A. purpurea*) has since been described by Prof. Zeller under the name of *Adela*

<sup>1</sup> This was not the case, however, in a specimen of *Calyptrorhynchus funereus* lately examined by me.

<sup>2</sup> Judging by its behaviour in captivity, *Agapornis* is extremely sluggish in its movements.

*biviella* (Verh. z.-b. Ges. Wien, xxiii. [1873], p. 226, pl. iii. fig. 10), where it is accurately figured.

The second (*A. bellela*) is closely allied to the European *Adela degeerella* (Linn.), differing only in the richer colouring and in the darker purple hind wings. The longitudinal stripes before and beyond the central band, as well as the margins of the band itself, are very distinct, and of a brilliant shot purplish-blue, whereas these and the central band itself are paler in the European species. The wings are perhaps slightly shorter in proportion to their length than in *A. degeerella*.

The third (*Adela albicornis*), which is very distinct from any other known *Adela*, was first described by Mr. Stainton as *Adela natalensis* (Trans. Ent. Soc. Lond. n. s. vol. v. p. 222), the specimens in the British Museum described by Walker being from Mr. Guenzius's collection, which also supplied some of those described by Mr. Stainton.

Dr. Brackenridge Clemens, Proc. Ent. Soc. Phil. 1864, vol. ii. p. 426, describes *Adela ridingsella* from Virginia.

Prof. Zeller, in the 'Verhandlungen der zoologisch-botanischen Gesellschaft in Wien,' vol. xxiii. (1873), describes *A. biviella* (p. 226, pl. iii. fig. 10) from Massachusetts, above referred to, *Adela chalybeis* (p. 225) from Texas, a species with which I am not acquainted, and *Adela schlägeri* (l. c. p. 227, pl. iii. fig. 11) from Ohio, of which the figure faithfully represents the species under the name of *A. ridingsella* in the collection of the Entomological Society of Philadelphia; and in vol. xxv. p. 342, pl. x. fig. 50, of the same publication he further describes and figures *Adela trigrapha* from California.

Mr. Chambers, in the 'Canadian Entomologist,' vol. v. p. 73, 1873, describes *Adela bella* and *Dicta coruscifasciella*, both from Kentucky. In (Can. Ent.) vol. viii. pp. 103, 104, he describes *Adela* (*Nemotois*?) *trifasciella*, *Adela fasciella* (which he suggests may be the female of the preceding species), and *Adela "flammeusella,"* all from California.

In (Can. Ent.) vol. ix. pp. 206, 207, he refers to *A. biviella*, Zell., and describes the female of this species (which has a "straw-yellow head") from Maine; he also amends his previous description of *A. bella*, and points out that his "*Dicta (Adela) coruscifasciella*" is the same species as *Adela schlägeri*, Zell., which it precedes.

The same author, in the 'Bulletin of the United-States Geological Survey,' 1878, vol. iv. no. 1, pp. 127, 128, in his "Index to the described Tineina of the United States and Canada" (in which he omits to notice any of the species described by Mr. Walker), gives a list of the known species of *Adela* from those countries. In this list he sinks his *A. fasciella* as a synonym of *A. trigrapha*, Zell., but retains as a distinct species his *A. trifasciella*, which he had previously suggested might possibly be the male of *A. fasciella*, and alters the spelling of *A. flammeusella* to *A. flamensella*.

After careful comparison of descriptions, of figures, and of type specimens where such has been possible, I would suggest the

following as the correct list and synonymy of the North-American species of this genus.

ADELA RIDINGSSELLA, Clem. Proc. Ent. Soc. Phil. ii. p. 426, 1864 ; Stainton, Tin. Nor. Am. (republishing of Clemens's papers), p. 250 ; Packard, Guide Stud. Ins. p. 348 ; Chambers, Bull. U.S. Geol. & Geog. Survey, iv. no. 1, p. 127.

*Dicte coruscifasciella*, Chamb. Can. Ent. vol. v. p. 74, 1873.

*Adela schlægeri*, Zell. Verh. z.-b. Ges. Wien, xxiii. p. 227, pl. iii. fig. 11.

*Dicte (Adela) coruscifasciella*, Chamb. Can. Ent. ix. p. 207.

*Adela (Dicte) coruscifasciella*, Chamb. Bull. U.S. Geol. & Geog. Survey, iv. no. 1, p. 127.

ADELA PURPUREA, Walk. Cat. Lep. Het. xxviii. p. 501, 1863.

*Adela viviella*, Zell. Verh. z.-b. Ges. Wien, xxiii. p. 226, pl. iii. fig. 10, 1873 ; Chamb. Can. Ent. ix. p. 206 ; Chamb. Bull. U. S. Geol. & Geog. Survey, iv. p. 127.

ADELA CHALYBEIS, Zell. Verh. z.-b. Ges. Wien, xxiii. p. 225 ; Chamb. Bull. U.S. Geol. & Geog. Surv. iv. p. 127.

ADELA BELLA, Chamb. Can. Ent. v. p. 73, Can. Ent. ix. p. 207 ; Bull. U.S. Geol. & Geog. Surv. iv. p. 127.

ADELA FLAMENSELLA, Chamb. Can. Ent. viii. p. 104 ; Bull. U. S. Geol. & Geog. Surv. iv. p. 127.

ADELA BELLELA, Walk. Cat. Lep. Het. xxviii. p. 501.

ADELA TRIGRAPHA, Zell. Verh. z.-b. Ges. Wien, xxv. p. 342, pl. x. fig. 50, 1875 ; Chamb. Bull. U.S. Geol. & Geog. Surv. iv. p. 128. (Plate XI. figs. 2, 3.)

♂. *Adela (Nemotois) trifasciella*, Chamb. Can. Ent. viii. p. 103 ; Bull. U.S. Geol. & Geog. Surv. iv. p. 128.

♀. *Adela fasciella*, Chamb. Can. Ent. viii. p. 103.

ADELA IOCHROA, Zell. Horæ Soc. Ent. Ross. xiii. p. 218.

To the above I may now add the four following from California and Oregon, raising the whole number of species of the genus *Adela* from the United States and Canada to 12 only. It is more than probable that many more yet remain to be discovered.

ADELA SEPTENTRIONELLA, sp. nov. (Plate. XI. fig. 1.)

♂. *Capite et palpis setosis, nigris ; antennis longissimis (triente basali supra nigro maculoso) albis ; alis anticis subpurpure-scenti-brunneis, fasciis duabus angustis albis, triente apicali squamis albis irrorato, ciliis apicalibus albis ; posticis brunneis.*

♀. *Capite ochreo ; antennis brevioribus.*

♂. Head and palpi, which project very conspicuously beyond it, roughly clothed with long black hairs. Antennæ more than three times the length of the fore wings, white, spotted with black above along

the basal third. Fore wings brown, with a slight purplish tinge, crossed by two narrow white bars, the inner bar is halfway between the base and the outer bar, which latter is slightly angulated outwards about the middle, and is situated slightly beyond the middle of the wing: beyond the outer bar is a small white angulate spot at the costa midway to the apex; and on the apical portion of the wing are, usually, some scattered small white dots and scales, varying in number and distribution. The cilia above the middle of the apical margins are white. Hind wings brown. Legs brown, tarsi spotted with white.

The female has the head covered with long bright ochreous hairs; the palpi black; antennæ as in the male, but scarcely a third longer than the fore wings; abdomen acuminate, with the anal segments much appressed laterally.

♂ and ♀. Mendocino county, California, May and June 1871, and Southern Oregon, May 1872.

Expanse 11 millims.

*ADELA SINGULELLA*, sp. nov. (Plate XI. fig. 4.)

♂. *Capite supra nigro, fronte albida; antennis longissimis albis; alis anticis brunneis vix purpurascentibus, fascia singula post medium alba; posticis pupurascentibus.*

♀. *Antennis paulo brevioribus; capite subgriseo, fascia vix latiore.*

♂. Head black above, face greyish, both roughly clothed; the palpi short, depressed, clothed with long black hairs beneath. Antennæ white, more than three times the length of the fore wings, not spotted. Fore wings brown, with a slight purplish tinge; cilia the same, a single narrow white fascia just beyond the middle, not visible on the underside except in a small costal spot, sometimes slightly angulated below the costa. Hind wings rather more purplish than the fore wings; the costal portion of the base, over which the fore wings lap when the wings are extended, is white. Legs brown; tarsi indistinctly spotted with whitish.

♀. With the head rather greyish, and the fore wings with a more greenish hue than those of the male, having the fascia also slightly wider. Antennæ only slightly shorter than those of the male.

Expanse 10 millims.

This species differs from *Adela sulzella* (Schiff.) in its smaller size, narrower fascia, and in the antennæ of the female being similar to those of the male, instead of being thickened to the middle.

♂, ♀. Mendocino county, California, May 25, 1871.

*ADELA LACTIMACULELLA*, sp. nov. (Plate XI. figs. 5 & 6.)

♂. *Capite supra purpurascente, fronte et palpis nigro-setosis; antennis albis, apud basin nigrescentibus; alis anticis subviridi-cupreis, maculis duabus costalibus una (nonnumquam secunda) dorsali ochreo-albidis; posticis subpurpureis.*

♀. *Palpis nigris, capite flavo; alis anticis cupreis, maculis duabus costalibus subconspicuis.*

Head purplish above, the face and palpi clothed with long black

hairs; antennæ white, clouded on the basal fourth, but not annulated, with black. Fore wings with the costa slightly raised near the base, greenish cupreous, a yellowish-white spot rather beyond the middle of the dorsal margin and two similar ones on the costa (one before and one beyond the middle), of which the outer one only is visible on the underside; sometimes a small faintly-indicated spot lies above the anal angle. Hind wings purplish, the base of the cilia greenish cupreous. Legs purplish, the tarsi rather grey.

Female with the palpi black, the head roughly clothed with long dark orange-yellow hairs, eyes smaller and wider apart than those of the male, antennæ nearly twice the length of the fore wings. The fore wings with a less greenish and more cupreous tinge than in the male; the dorsal spot obsolete; the costal spots much less conspicuous than those in the male, especially the one nearest the base.

Expanse 14 millims.

♂, ♀. Mendocino County, California, June 10, 1871.

*ADELA SIMPLICIELLA*, sp. nov. (Plate XI. fig. 7.)

♂. *Capite hirsuto, ochreo; antennis vix longioribus quam alæ, fuscis; alis anticis subviridi-cupreis, apud costam et apicem purpurascens, posticis purpureis.*

♀. *Antennis aliquot brevioribus.*

♂. Head roughly clothed with ochreous hairs above, the face rather smoother; palpi sparsely clothed with long hairs below, the apical joint smooth; antennæ about the length of the fore wings, purplish fuscous. Fore wings greenish cupreous towards the base, tinged with purple, especially on the costal and apical portions of the wing. Hind wings purplish; legs purplish; tarsi slightly paler; undersides of both dull brownish purple.

The female apparently differs from the male only in the length of the antennæ, which are about two thirds the length of the fore wings.

Expanse 10 millims.

♂, ♀. Southern Oregon, May 1872.

Allied to *Adela rufimetrella* (Scop.) and *A. violella* (Tr.).

I may now add to the Indian species of this group two new species received from the Rev. H. Hocking of Dharmasala:—

*ADELA GEMMELLA*, sp. nov. (Plate XI. fig. 8.)

♂. *Antennis longissimis, roseo-cupreis, articulo basali cum capite supra et infra metallice roseis; palpis brevibus, albedo-flavidis; alis anticis triente basali flavo, strigis longitudinalibus tribus roseo-aureis, deinde ad apicem nitide roseo-aureis excepta fascia mediana flava utrinque atro marginata; posticis brunneo-cupreis, ciliis paulo pallidioribus.*

Antennæ nearly four times the length of the fore wings, shining, rosy cupreous, the basal joint brilliant, rosy metallic. Head smooth, shining, metallic above and below, a fringe only of short rough hairs



surrounding the eyes; palpi pale yellowish, short, not projecting beyond the head, having a few long hairs on the underside. Thorax brilliantly metallic rosy golden. Fore wings with the basal third dull yellow, longitudinally streaked with three brilliant metallic blue and rosy lines—one along the costa, one on the middle, and one above the dorsal margin; these are blended in a brilliant rosy metallic band, which precedes a yellow central fascia, margined narrowly on its outer, more widely on its inner edge with black; this fascia is narrow towards the dorsal, widening towards the costal margin; beyond it the remaining portion of the wing, to the end of the cilia, is brilliantly golden, shot with rosy purple.

♂. Expanse 13 millims.

I received several males of this most beautiful species from the Rev. H. Hocking, from Dharmsala, in the Punjab. It is probably allied to *Adela orientella* (Staud.).

*ADELA GRISEELLA*, sp. nov. (Plate XI. figs. 9 & 9a.)

♂. *Antennis longissimis, griseo-albidis excepta basi cuprea, palpis brevibus, capite pæne nudo; alis anticis griseo-albidis subpurpureis atomis irroratis, fascia mediana interne nigro marginata alba, posticis dilute brunneis.*

♀. *Antennis flocco ultra medium incrassatis, cupreis, triente apicali nudo albido.*

♂. Antennæ nearly three times the length of the fore wings, greyish white shaded with cupreous at the base; palpi short and inconspicuous, whitish; head nearly smooth, greyish white. Fore wings greyish white, profusely irrorated, especially towards the apex, with purplish cupreous scales, with a slightly bowed median fascia of almost uniform width, dark-margined on its inner edge. Hind wings very pale brownish. Legs brownish cupreous, the tarsi spotted with white.

♀. Antennæ about the length of the fore wings, clothed, except the whitish apical third, with cupreous scales, which form a thick tuft at about two thirds of their length.

Expanse 13 millims.

Dharmsala, Punjab. Received from the Rev. H. Hocking.

Genus *INCURVARIA*, Haworth.

*INCURVARIA SOLENOBIELLA*, sp. nov. (Plate XI. fig. 10.)

♀. *Capite hirsuto, albido; alis anticis cum ciliis albidis, squamis subnitide aneis irregulariter conspersis, posticis cum ciliis dilute griseo-cinereis.*

Head and palpi whitish. Antennæ cinereous, somewhat annulated with whitish towards the base in the female, slightly pubescent in the male. Fore wings whitish, thickly sprinkled with rather shining, yellowish, brassy scales, more conspicuous in the female than in the male, and grouped into irregular blotches, especially along the apical margin and about the middle of the wing; cilia whitish. The hind wings are pale greyish cinereous; the cilia the same. The male

is slightly larger than the female, and has much the appearance of a *Solenobia*, especially when slightly worn.

Expanse, ♂ 18 millims., ♀ 16-17 millims.

Near San Francisco, May 19th, 1871.

I have several specimens of this species, of which the females are in better condition than the males. One, or perhaps two other unicolourous species of *Incurvaria* were met with in May and June of the following year in Oregon; but I shall not venture to describe them until I can be more certain that they do not belong to some of the numerous European species.

#### Genus MICROPTERYX, Hübner.

Two species only of this genus have, as far as I am aware, been described from North America; and of these one only is mentioned in Chambers's "Index to described *Tineina*," in the 'Bulletin of the United-States Geological and Geographical Survey,' 1878. This is *Micropteryx pomivorella*, Pack. (Rep. Mass. Ag. Soc. 1870, Am. Nat. vi. p. 685). The other is *Micropteryx luteiceps*, Walk. (Cat. Lep. Het. xxviii. p. 494), from Nova Scotia, a good and distinct species.

To these may be added the following species from the Western States:—

#### MICROPTERYX PARDELLA, sp. nov. (Plate XI. fig. 11.)

*Capite hirsuto ochreo; antennis fuscis; alis anticis subpurpurascenscupreis, litura dorsali apud basin et maculis duabus post medium aliquando confusis, cum ciliis apicalibus æneo-flavidis, posticis cupreis.*

Head bright ochreous, roughly clothed. Antennæ dusky, rather coarse in the male. Fore wings purplish cupreous, with two conspicuous brassy-yellow spots beyond the middle; the upper of these, which is the largest, is obliquely quadrangular, reaching the costa along its upper edge, and sometimes blended with the lower and smaller one, which is slightly beyond it and contiguous to the dorsal margin at the anal angle. Before the middle, touching the dorsal margin, and reaching more than half across the wing, is an irregular-shaped spot of a similar colour, blending by means of a yellowish intermediate shade with a small similar spot at the base of the wing. The cilia at the apex and apical margin are brassy yellow, at the anal angle cupreous. Hind wings cupreous. Abdomen dusky.

♂. Expanse 10 millims.

Five specimens, taken on the borders of the forest of "redwood" (*Taxodium sempervirens*) near the coast, in Southern Oregon, at the beginning of June 1872.

#### MICROPTERYX AUROSPARSELLA, sp. nov. (Plate XI. fig. 12.)

*Capite subgriseo; antennis brevibus, cinereo-fuscis; alis anticis purpureis, squamis aureo-metallicis creberrime conspersis, posticis purpureis.*

Head rough, greyish. Antennæ short, less than half the length

of the fore wings, dusky. Fore wings bright purple, thickly and regularly sprinkled with bright golden metallic scales; the cilia mixed purple and golden. Hind wings purple.

Expanse  $7\frac{1}{2}$  millims.

A small but distinct species, about the size of *M. calthella*.

One specimen, taken in Southern Oregon in May 1872.

I have a single specimen of another undescribed species from Northern Oregon, April 1872, but scarcely in sufficiently good condition to be determined with certainty.

Head dusky greyish. The fore wings purple, dusted with thickly scattered yellowish and whitish scales, giving a slightly blotched appearance, and forming an ill-defined spot on the dorsal margin before the anal angle. The cilia are pale, and the hind wings very transparent cinereous.

Expanse 9 millims.

Apparently allied to the European *M. unimaculella*.

I leave it to be named by any one who may be able to verify the description by obtaining a series of specimens in better condition.

#### Genus HYPONOMEUTA, Zeller.

Mr. Walker, in his 'Catalogue of Lepidoptera Heterocera in the British Museum,' part xxviii. p. 530, describes *Hyponomeuta ordinatellus* ♂ and ♀, of which he says:—"Alæ posticæ nigricanti-cinereæ, fimbria alba;" and in part xxx. p. 1016, he mentions *Hyponomeuta "multipunctellus,"* Clem., and refers his *H. ordinatellus* to this species. Dr. Clemens described his *H. multipunctella*, in the 'Proceedings of the Academy of Natural Sciences of Philadelphia' for 1860, p. 8, as having the hind wings "blackish grey," but without mentioning the sex of his type. The single specimen placed by Mr. Walker under the two names—first, *ordinatellus*, Walk., and secondly, *multipunctellus*, Clem.—has decidedly white hind wings, and is therefore evidently not one of those from which the original description was made, and which were said to have come from Canada. A reference to the Register shows that the specimen was "purchased from Mr. Dyson," in a miscellaneous collection of North-American insects. It is probably the one mentioned by Mr. Walker (erroneously) as having been "presented by Mr. Doubleday," since he only refers to one specimen as existing in the national collection, and no other can be found. If this specimen is a female (of which I am not at present absolutely convinced), it will agree with Prof. Zeller's redescription of *H. multipunctellus*, Clem., in the Verh. z.-b. Ges. Wien, xxiii. p. 228, where he writes:—"Post. ♂ dilute cinereis albo ciliatis, ♀ totis albis." Prof. Zeller points out that if Walker's original *H. ordinatellus* had the hind wings dark in both sexes, it cannot be the same species as *H. multipunctella*, Clem. There must, then, be two distinct species agreeing in all other particulars; and this remains to be proved. But it seems more probable that Mr. Walker may have been mistaken as to the sex of one of his ori-

ginal types, especially as he himself subsequently referred a specimen with white hind wings to the same species. I have a female with white hind wings in my own North-American collection.

#### Genus ANESYCHIA, Hübner.

In the "Index to the described *Tineina* of the United States and Canada," given by Mr. Chambers in the 'Bulletin of the U.S. Geological and Geographical Survey,' vol. iv. (1878), in enumerating the species which have been placed in the genus *Anesychia*, he includes "*A. sparsicella* (sic), Clem." (Proc. Ent. Soc. Phil. ii. p. 430), described from specimens in the collection of the Entomological Society of Philadelphia. This species should be placed in the genus *Cryptolechia* (Zell.). It is the *Cryptolechia contrariella* of Walker's 'Catalogue,' part xxix. p. 771, the preface of which is dated March 7th, 1864—the same month in which Dr. Clemens's description appeared. The same species is also described and figured by Prof. Zeller (Verh. z.-b. Ges. Wien, xxv. pp. 343, 344, pl. x. fig. 51) under the name of *Cryptolechia atropicta*; the only difference appears to be the absence in this figure and description of a small black spot at the base of the dorsal margin, which exists in Clemens's and Walker's specimens.

If I am correct in believing the three authors above quoted to refer to the same species, its synonymy would be as follows:—

CRYPTOLECHIA CONTRARIELLA, Walk. Cat. Lep. Het. xxix. p. 771.

*Anesychia sparsiciliella*, Clem. Proc. Ent. Soc. Phil. ii. p. 430; Stainton, Tin. N. Amer. p. 255.

*Cryptolechia atropicta*, Zell. Verh. z. b. Ges. Wien, xxv. pp. 343, 344, pl. x. fig. 51.

*Anesychia sparsicella*, Cham. Bull. U.S. Geol. and Geog. Surv. iv. p. 129.

ANESYCHIA HAGENELLA, Chambers, Bull. U.S. Geog. and Geol. Surv. iv. p. 81.

This species seems to be nearly allied to *Psecadia semilugens*, Zell., = *Anesychia multipunctella*, Cham. (non *Hyponomeuta multipunctella*, Clem.), and should perhaps more properly be placed with some of its allies in the genus *Psecadia* (Hübner.).

#### Genus PSECADIA, Hübner.

Zeller, in the 'Horæ Soc. Ent. Ross.' xiii. pp. 235, 236, pl. iii. fig. 71, describes and figures *Psecadia xanthorrhœa*, from Porto Rico. A comparison of the figure, which is very accurate, with a specimen in the British Museum shows this to be the species described by Walker (Cat. Lep. Het. xxviii. p. 536) as *Psecadia notatella*, from St. Domingo.

The following new species, belonging to the genera *Hyponomeuta* and *Psecadia* are at present in my collection. I have also here

described two new species of the genus *Lampronia*, Zell., from North America, of which no examples, as far as I am able to ascertain, have hitherto been observed in that country.

Genus *HYPONOMEUTA*, Zeller.

*HYPONOMEUTA LAPIDELLUS*, sp. nov. (Plate XII. fig. 1.)

*Capite, antennis et palpis dilute griseis; alis anticis saturate plumbeo-griseis, punctis sex in dimidio basali, quatuor in dimidio apicali nigris pallide submarginatis, octo in marginibus apicali et costali dispositis; posticis subgriseis; abdomine ochreo.*

Head stone-grey, palpi projecting scarcely half the length of the head beyond it, the apical joint rather more than half the length of the second, both stone-grey. Antennæ the same. Thorax with two black spots in front and one behind; the wing-coverts tipped with black. Fore wings rather shining, cold stone-grey, with eighteen black spots, indistinctly and narrowly pale-margined, arranged as follows—two rather elongate, below the basal third of the costa, two on the lower edge of the cell, also before the middle, one on the middle of the cell beyond them, and one near the base of the dorsal margin, with a group of four on the outer third of the wing, which are followed by eight marginal spots, of which five belong to the apical and three to the costal margin. Hind wings pale greyish. Abdomen and tuft ochreous. Legs grey.

Expanse 19 millims.

Larva pale yellowish ochreous, with a double row of elongate black spots just touching each other on the middle of each segment, and connected by a slender black subdorsal line, except between the third and fourth segment, where it is interrupted by a band of the pale ground-colour. Below the subdorsal line is a row of reniform black spots on each segment after the fourth. Head black; second segment with two brownish-fuscous plates divided by a yellowish line. Anterior legs black; prolegs yellowish ochreous; a few single scattered hairs on each segment.

Received from the Rev. H. Hocking, who found the larvæ at an elevation of about 4500 ft. near Dharmasala, July 12th, feeding on "soongroo" (wild salvia). The moths emerged on the 1st of August.

Genus *PSECADIA*, Zeller.

*PSECADIA*? *CUPREONIVELLA*, sp. nov. (Plate XII. fig. 2.)

*Capite et thorace niveis; palpis subpurpureis, albo-acuminatis; alis anticis cupreo-violaceis, guttis sex distinctis aliis aliquot confusis irregulariter dispersis niveis, costæ basi cærulea; posticis dilute griseo-brunneis, basi albida; abdomine grisescenti-brunneo, flocco anali aurantiaco.*

Head, thorax, and patagia white. Antennæ pale greyish brown, the basal joint slightly thickened, dark purplish. Palpi slender, the apical joint rather more than half the length of the second joint, purplish, with the extreme tip white; second joint purplish above, white

below. Tongue scaled with white at the base. Fore wings glossy cupreous violet, with large shining snow-white spots and blotches; six spots on the basal half and middle of the wing (three upon and three below the cell) well defined and separate, others along the costa and on the apical third of the wing contiguous to the anal angle more or less blended and irregular; a white spot on the middle of the base is blended with another at the base of the dorsal margin; above it, on the costa, and beyond it, on the median vein, are shades of dark glossy blue, which are also to be found on the lower half of the apical margin above the anal angle. The costa, except at the extreme base, is white; the cilia white, tinged around the apex with greyish brown at their tips. Hind wings pale greyish brown, rather whitish, but not quite transparent towards the base. Abdomen greyish brown, whitish beneath; the anal tuft orange-ochreous. The femora of the first pair of legs are orange-ochreous beneath; the tibiæ and tarsi greyish brown beneath, white above. The second and third pairs of legs have the base only of the femora orange-ochreous, the tibiæ and tarsi spotted with purplish brown.

1 ♀. Expanse 28 millims.

Rio do Espirito Santo, Brazil.

I have been unable to find any figure or description of this beautiful Brazilian species. It seems to agree more nearly with *Psecadia* (Zeller) than with any other genus; but there is a slight difference in the neuration of the hind wings; moreover the head is slightly broader and the antennæ longer than in the European and North-American forms of that genus. It differs from the genus *Oeta* (Grote) in having veins eight and nine of the fore wings arising from a common pedicle, not separately, as in that genus, agreeing in this respect with *Psecadia*, where I would place it at least provisionally.

*PSECADIA MONTICOLA*, sp. nov. (Plate XII. fig. 3.)

*Capite, antennis et palpis obscure schistaceis; alis anticis schistaceis, lineis punctisque nigris in longitudinem impositis; margine dorsali anguste nigro, punctis marginalibus nigris undecim secuto; posticis fuliginis; abdomine (excepta basi nigra) et tibiis posticis flavis.*

Head, antennæ, and palpi dark slaty grey, the latter upturned, with the apical joint long and pointed. Fore wings rather shining, dark slaty grey, with black spots and streaks, four on the basal half along the lower edge of the cell; two attenuated streaks on the outer edge of the cell, with three immediately beyond it, of which the upper one is the longest and is sometimes joined to the upper of the two on the cell; three oblique streaks below the costa, of which the outer one is the shortest and most oblique, the inner one the reverse. These are followed by a series of four spots along the apical portion of the costa, and seven similar spots along the apical margin, reaching to the anal angle, from which a narrow black line runs along the dorsal margin to the base. Hind wings dark smoky grey; the cilia the same except at the abdominal margin and angle, where they are

pale ochreous. Abdomen bright orange-ochreous, except at the extreme base, which is blackish. First and second pair of legs, together with the underside of the wings, dark smoky grey; the first pair with indistinct pale spots at the joints; third pair bright orange-ochreous; the tarsi with blackish annulations.

Expanse 25 millims.

♂. Taken on the Siskiyou range of mountains on the borders of California and Oregon, June 10th, 1872. Allied to the European *Psecadia chrysopyga* (Zell.), and approaching in appearance *Anesychia cirrhocnemis*, Led., Horæ Ent. Soc. Ross. viii. p. 25, pl. ii. fig. 8.

*PSECADIA ARCTOSTAPHYLELLA*, sp. nov. (Plate XII. fig. 4.)

*Capite subcæruleo-albo, antennis, excepta basi supra albida, fuscis; thorace sexpunctato; alis anticis subcæruleo-albis, minus apud costam, præcipue apud cellulam squamis fumosis adumbratis; punctis marginalibus nigrescentibus undecim; posticis subflavescenti-griseis; abdomine ochraceo, tibiis posticis ochraceis, tarsis nigro annulatis.*

Head bluish white; antennæ fuscous, with some white scales above at the base; palpi bluish white, shaded on their outer sides with blackish scales. Thorax bluish white, with six black spots, three on each side, and a few black scales forming an indistinct spot at the back of the head. Fore wings bluish white; the costal half is much occupied by smoky blackish scales, which form a strong shade along the middle of the wing from the base to the end of the cell, and a slight shade projecting downwards beyond it; the dorsal half is of the plain bluish white ground-colour, into which the median shade gives out a slight projection about the middle of the wing, and a small semi-detached spot pointing inwards nearer to the base; along the apical margin are ranged eight or nine blackish spots, with two or three more indistinct ones along the costa near the apex; cilia greyish. Hind wings grey with a slight yellowish tinge; cilia yellowish, especially at the abdominal margin. Abdomen yellow, shaded with greyish at the base. First and second pairs of legs blackish, the tarsi with white annulations; third pair of legs yellow, the tarsi with blackish annulations.

Expanse 22 millims.

This species is nearly allied to *P. bipunctella* (Fab.), but it differs in the bluish white, not pure white, ground-colour of the fore wings, and in the less intense black and somewhat different form of their shaded portion, which is much paler towards the costa than in that species, differing also in this respect from *Anesychia hagenella* (Cham.), as well as in its larger size.

I met with the species above described in Mendocino and Lake counties, California, in the middle of June 1871, and bred one specimen on the 18th of June from a pupa found near San Francisco on the 20th of May, in a delicate cocoon in a leaf of *Manzanita* (*Arctostaphylos glauca*, Lindl.), which the imago frequents.

*PSECADIA SUBCÆRULEA*, sp. nov. (Plate XII. fig. 5.)

*Præcedenti affinis; alis anticis subcæruleo albis, lineis et maculis irregularibus fumosis præcipue supra trientem dorsalem conspersis; margine dorsali peranguste fumoso.*

This species differs from the last named (*Psecadia arctostaphylella*) in its slightly larger size, and in the absence of any generally connected shade over the costal half of the fore wings. This is as it were replaced by a series of disconnected smoky blackish streaks of varying size and distinctness. The most noticeable of these are an elongate shade from the base immediately below the costa; a short oblique dash below it also on the basal third of the wing. One or two semiconnected parallel streaks along the cell about the middle of the wing; a spot, with three projecting limbs on its outer side, lying between the lower angle of the cell and the anal angle, and a very slender blackish line all along the dorsal margin. The veins surrounding the cell are also more or less indicated by lines of blackish scales. In some varieties, perhaps slightly worn, the markings are much less distinct than in others.

It is nearly allied to *P. arctostaphylella*, and frequents the same probable food-plant, so that a comparison of the larvæ would be interesting, in order to establish or to refute the distinctness of the two species; but it differs, as I have shown, in having no distinctly separate pale and dark portions on the fore wings; and, moreover, in the slender line along the dorsal margin, which does not occur in that species.

Expanse 25 millims.

♂ ♀. Sonoma and Mendocino counties, California, May 23rd and June 13th, 1871.

*PSECADIA ALBISTRIGELLA*, sp. nov. (Plate XII. fig. 6.)

*Capite et thorace subnigrescenti-brunneis, linea alba circumcinctis; alis anticis subnigrescenti-brunneis, striga submedia angusta alba a basi ad finem cellulæ producta furcam brevem gerente, punctis novem marginalibus nigris, posticis paulo pallidioribus; abdomine (postice) et tibiis posticis flavis.*

Head blackish brown, with a white line on each side above, which is carried round the blackish-brown thorax, forming an angle behind it, with the apex pointing forward. Palpi blackish brown, the apical joint upturned, long, and pointed, a small white spot at the junction of the second and third joints. Antennæ more than half the length of the fore wings, blackish brown. Fore wings blackish brown, a narrow white steak of even width running from the base along the lower edge of the cell, and terminating in a short fork at its lower external angle; the lower half of the fork is sometimes obsolete; there is a row of nine black dots preceding the cilia, three on the costal and six on the apical margin. Hind wings and cilia very slightly paler than the fore wings. Abdomen bright orange-ochreous except at the base, which is blackish brown. Legs blackish, except the third pair, which are bright orange-ochreous, and have the ex-



tremity of the tarsi spotted with blackish brown. Underside of wings uniformly dull smoky brown.

Expanse 15 millims.

♂ ♀. Taken on the Siskiyou Mountains, on the borders of California and Oregon, June 8th, 1872, at an elevation of about 6000 ft. A very distinct and interesting little species of the group to which belong *P. chrysopyga* and *P. monticola*.

*PSECADIA ERMINEELLA*, sp. nov. (Plate XII. fig. 7.)

*Capite et thorace griseo-albidis, hoc uno, illo quatuor punctis nigris impositis; alis anticis griseo-albidis, maculis tredecim mediis, decem minoribus marginalibus nigris; posticis dilute griseis, ciliis pallidioribus.*

Head greyish white, with a black spot above between the antennæ. Palpi greyish white, with a black band round the base of the apical joint. Antennæ blackish. Thorax greyish white, with four black spots, one in front, one at each side, and one larger and more conspicuous than the others behind. Fore wings greyish white, with thirteen black spots on their surface, some of which are elongate, besides ten smaller marginal spots, of which four are on the costal, six on the apical margin; the first black spot is at the base, beneath the costa, the second on the costa; slightly beyond these two, somewhat diffused beneath them, is a smaller one at the base of the cell, followed by four more along its lower edge, of which the second is rather lower than the others; the two largest and most conspicuous spots are elongate, and situated on the cell; these are followed by a smaller one beyond it, and above them are the three remaining subcostal spots. Hind wings pale greyish, with whitish-grey cilia. Abdomen and legs whitish grey. Underside of fore wings brownish grey.

Expanse 22 millims.

Received from the Rev. H. Hocking, from Dharmasala, in the Punjab.

*PSECADIA HOCKINGELLA*, sp. nov. (Plate XII. figs. 8, 9, & 9 a.)

*Capite et thorace dilute schistacco-griseis, palpis albido-griseis, nigro annulatis; alis anticis dilute schistaceo-griseis, punctis elongatis et strigulis nigris in longitudinem diverse dispositis, et punctis duodecim marginalibus; abdomine cum tibiis posticis flavis, tarsis posticis albo nigroque annulatis.*

Head pale slaty grey. Palpi whitish grey, with two black annulations on the second and one on the apical joint. Antennæ dusky greyish, the basal joint touched with black. Thorax pale slaty grey, with six black spots, besides two more minute ones at the base of the patagia, arranged as follows—one in front, one on each side, and three placed in the form of a triangle behind. Fore wings smooth, rather shining, pale slaty grey, with numerous black slender streaks and elongate black spots, a black elongate spot at the base of the costa, six slender subcostal streaks, below them a long slender streak running from before the middle of the wing nearly

to the apical margin, with a semi-detached elongate spot at the upper edge of its inner extremity, a small detached streak lying above its outer extremity. At the base of the wing is a small spot, followed by one long and two shorter streaks along the lower edge of the cell, beneath which are three spots, the second and third sometimes connected by an arched line. A reduplicated spot lies above the anal angle, and a small single spot at the base of the dorsal margin. Besides these there are eight small spots along the apical margin, and four on the costal side of the apex. Hind wings pale grey, cilia slightly paler. Abdomen bright orange-ochreous. The first and second pairs of legs grey, annulated with black, the third pair bright orange-ochreous; the tarsi annulated with black and white.

Expanse 30 to 32 millims.

♂ and ♀ and beautifully preserved larvæ received from the Rev. H. Hocking of Dharmasala, in the Punjab, a most energetic collector and careful observer, after whom I have much pleasure in naming this species, whilst acknowledging his kind and much-valued assistance.

Larva pale yellow and black, with a tinge of orange at the side of each segment. Head black, with a pale yellowish stripe across the face, second segment orange and black. Along the middle of the back is a row of conspicuous pale yellow spots, two on each segment after the third, the anterior spot slightly indented at the sides and behind, sharply indented in front with black, the second somewhat square, with a black spot in its centre. On each side of the back is a reduplicated black stripe, containing about three pale yellowish spots on each segment. The sides of the segments about the spiracles are pale yellowish with an orange tinge, spotted with black; and above the legs runs a narrow black festooned stripe. There are several wart-like tufts of thinly growing hairs on each segment. Anterior legs black, prolegs pale yellowish.

Found April 26th, at an elevation of about 4000 feet, feeding on "Poonah," probably *Ehretia serrata*, Rox., one of the Boraginæ.

Mr. Hocking says of this larva:—"On Poonah tree, wonderfully active, with a snake-like action, exceedingly swift, either backwards or forwards, at pleasure; spun up the 3rd of May, came out 4th to 9th of June."

#### LAMPRONIA, Zeller.

LAMPRONIA OREGONELLA, sp. nov. (Plate XII. fig. 11.)

*Capite supra hirsuto flavo, antennis pubescentibus albo et fusco annulatis; alis anticis brunneis, fasciis duabus et puncto costali ante apicem cum ciliis canis, posticis cinereis.*

Head orange-yellow, very rough above, smoother in front. Antennæ of the male pubescent, scarcely half the length of the fore wings, annulated with white and fuscous. Fore wings brown, with two fasciæ and a costal spot white, a fascia at the basal fourth pointing obliquely inwards from the costa, and wider on the dorsal margin; another fascia, slightly beyond the middle, which appears

to consist of two elongate triangular spots, one on the costal and one on the dorsal margin, joined on the middle of the wing by a narrow streak running inwards and upwards, and connecting the apex of the dorsal spot with that of the costal; halfway between the fascia and the apex is a small elongate white costal spot; the cilia are also white, except at the angle, where they are brown. Hind wings greyish cinereous.

Expanse 22 millims.

1 ♂, reared from a larva found boring in the stems of a species of Saxifrage, on rocks near Canyon City, on John Day's River, Oregon, March 30, 1872; bred May 22nd. The larva, which I did not describe at the time, has much the habit of that of *Lampronia rubiella* (Bjerk.), boring in the inside of the stems of its food-plant, the empty pupa-case protruding from the injured shoot.

LAMPRONIA TRIPUNCTELLA. (Plate XII. fig. 10.)

*Capite hirsuto flavo; antennis fusco et albo annulatis; alis anticis subpurpureiscenti-brunneis, fascia basali, maculis (duabus costalibus, una dorsali) triangularibus cum ciliis subflavescenti-albidis, posticis subpurpurascenscentibus.*

Head rough above, yellow. Antennæ faintly annulated with white and fuscous. Fore wings rather purplish brown, with a faintly yellowish white fascia on the basal fourth, somewhat wider towards the dorsal margin, and with two costal and one dorsal spot of the same colour, all somewhat triangular, of which the dorsal (which is beyond the middle) is the largest, and the outer costal is the smallest; the cilia also faintly yellowish white, except at the anal angle. Hind wings pale purplish, with slightly paler cilia.

Expanse 14 millims.

One specimen, purchased in a miscellaneous collection from North America. No exact locality given.

The ornamentation of this species reminds one much of Herrich-Schäffer's figure 275 of *Tinea vinculella*, H. S., which, however, is a much smaller insect and has not white cilia.

EXPLANATION OF THE PLATES.

PLATE XI.

- Fig. 1. *Adela septentrionella* ♂, p. 79.  
 2. — *trigrapha* (Zell.) ♂, p. 79.  
 3. — ♀, p. 79.  
 4. — *singulella* ♂, p. 80.  
 5. — *lactimaculella* ♂, p. 80.  
 6. — ♀, p. 80.  
 7. — *simpliciella* ♂, p. 81.  
 8. — *gemmella* ♂, p. 81.  
 9. — *grisella* ♂, p. 82.  
 9a. — —, head and antennæ of ♀.  
 10. *Incurvaria solenobiella* ♀, p. 82.  
 11. *Micropteryx pardella*, p. 83.  
 12. — *aurosparsella*, p. 83.

## PLATE XII.

- Fig. 1. *Hyponomeuta lapidellus*, p. 86.  
 2. *Pseccadia? cupreonivella*, p. 86.  
 3. *Pseccadia monticola*, p. 87.  
 4. — *arctostaphylella*, p. 88.  
 5. — *subcærulea*, p. 89.  
 6. — *albistrigella*, p. 89.  
 7. — *ermineella*, p. 90.  
 8. — *hockingella*, p. 90.  
 9. — —, larva slightly enlarged.  
 9a. — —, back view of two segments, much enlarged.  
 10. *Lampronia tripunctella*, p. 92.  
 11. — *oregonella*, p. 91.

## 4. On the Synonymy of the Kaffir Crane.

By W. B. TEGETMEIER, F.Z.S.

[Received February 17, 1880.]

The Kaffir Crane is usually termed *Balearica regulorum* (Licht.), apparently on the authority of Mr. E. T. Bennett, Vice-Secretary of this Society, who, at the meeting held on November 12, 1833, "exhibited specimens of Crowned Cranes from Northern and from Southern Africa, with the view of illustrating the characters which distinguish as species the birds from these several localities. Their specific distinction, he stated, on the authority of Professor Lichtenstein, had been pointed out, nearly thirty years since, by the Professor's father, who gave to the Cape bird the name of *Grus regulorum*; this distinction has, however not been generally known among ornithologists, although to those connected with the Society it has for some time been familiar, from observation both of numerous skins and of living individuals. In the bird of North Africa, for which the specific name of *pavoninus* will be retained, the wattle is small, and there is much red occupying the lower two thirds of the naked cheeks; in that of South Africa the wattle is large, and the cheeks are white, except in a small space at their upper part; the neck also is of a much paler slate-colour than that of the North-African species" (Proc. Zool. Soc. 1833, p. 118).

In this communication Mr. Bennett adopted the generic name *Anthropoides*, Vieill., Mr. Gray advocating the retention of the name *Balearica*; but in the 'Gardens and Menagerie of the Zoological Society,' 1835, Mr. Bennett described one species only, which he called *Balearica pavonica* (Vig.); and for this he gave a figure of the Kaffir Crane!

Neither does the name appear to have been employed by the elder Lichtenstein; for the "Cat. Dupt. Berl. Mus. 1793," quoted by Layard in his 'Birds of South Africa,' appears to be a combination of the Latinized title of 'Verzeichniss der Doubletten des zoologischen Museums der königl. Universität zu Berlin, von Dr. H. Lichtenstein,' Berlin, 1823, in which the species is not named, with the date of the following—'Catalogus rerum naturalium rarissimarum,

Hamburgi, d. xxi. October, 1793, auctionis lege distrahendarum,' with preface by M. Ant. Aug. Hen. Lichtenstein, Rector der Johannis-Schule, Berlin. A copy of the latter catalogue exists in the Banksian Library; and in it the Western Crowned Crane is included under the generic name of *Ardea*, and the Kaffir Crane is described as follows:—

"284 A. !! *Ardea chrysopelargus, nobis. Ardea oculorum area nuda; corpore supra item collo et pectore ex fusco æneo; subtus albo. Rostrum fere 10 pollices longum rubrum basi exalbidum. Nares lineares ultra 4 pollices longæ, mandibulam superiorem in medio quasi sulco pervio dirimunt. Genæ et collum purpureo nitore fulgent, reliquum corpus, quatenus ex æneo fuscum est viridi splendore renidet. Remiges nigrae; rectrices supra sunt æneæ, infra ut venter et crissum albescent. Pedes 29 pollices longi, pallide rubri. Digiti antici basi palmati, posticus brevis terram tamen attigens. Longitudo universa 4 pedum  $6\frac{1}{2}$  pollicum. Habitat in terra Caffrorum."*

Consequently it appears that, if the rules of the usually accepted code of nomenclature are to be carried out, the name of this species must be changed from *B. regulorum* to *Balearica chrysopelargus* (Licht.)—the meaningless name *regulorum* being apparently, as suggested by Mr. Sclater, a corruption of the term *oculorum* in A. A. H. Lichtenstein's description.

5. On the Land-Shells, extinct and living, of the Neighbourhood of Menton (Alpes Maritimes); with Descriptions of a new Genus and of several new Species. By GEOFFREY NEVILL, C.M.Z.S.\*

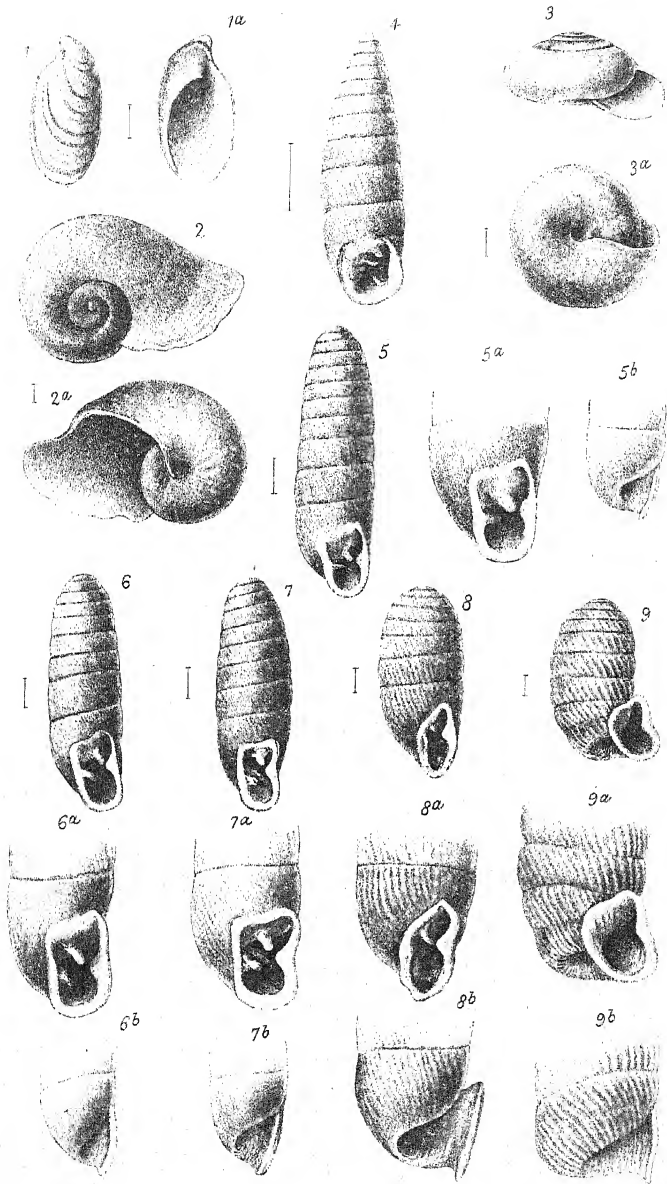
[Received February 13, 1880.]

(Plates XIII., XIV.)

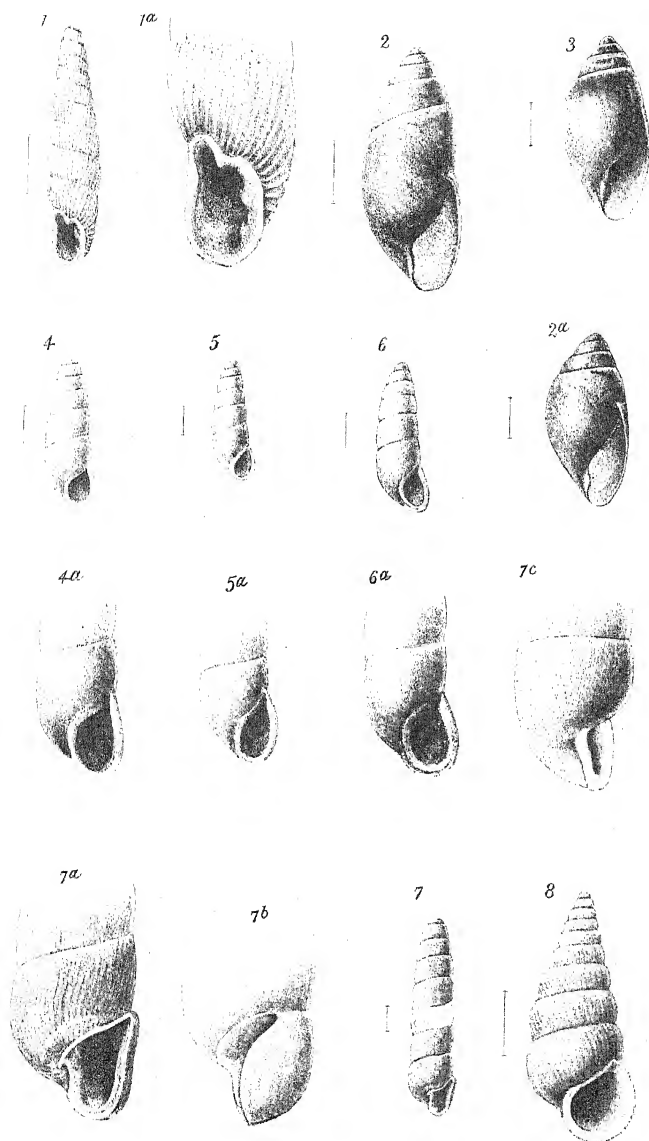
I cannot do better than commence by acknowledging, in the warmest manner, the great obligation I am under to two gentlemen for their cordial assistance and cooperation in collecting and determining the material of this paper. In the first place my thanks are due to my friend Mr. T. B. Coombe Williams, M.A., who during the winter and spring of 1878–1879 was good enough to collect for me the land-shells living on the high peaks of the Alpes Maritimes surrounding Menton, where I was unable to go myself on account of my health, and to whom also I owe the discovery of the first *Acme foliniana*, *Daudebardia isseliana*, &c., as well as of many of the spots where we afterwards together collected the interesting extinct land-shells, to describe which is my principal object in writing this paper.

To my distinguished friend Monsieur J. René Bourguignat, the well known author of numerous papers on the faunas, extinct and living, of the Quaternary Epoch, my best thanks are also due

\* Communicated by Lieut.-Col. H. H. Godwin-Austen, F.Z.S.







C. Achillea lith.

Hartart imp.

LAND SHELLS FROM MENTONE.





for the way in which he has placed his magnificent collection of European land-shells, by far the finest in existence, at my disposal for examination, and still more for the exceedingly kind way in which he has been good enough to carefully examine these Menton Mollusca, and to give me his opinion concerning their correct identification.

The land-shells of Menton belong to three distinct periods, or phases, of our Quaternary Epoch; and none of them I regard as true fossils; I would define as such only forms which existed in prior epochs.

1. *Cave period* (phases éozoïque et dizoïque, possibly both, of Bourguignat, Rev. et Mag. Zool. 1877, pp. 11-15, also Ann. Sci. Géolog. vi. p. 37).

2. *Intermediate period*, or Zone of *H. paretiana* (? phase trizoïque, Bourguignat, l.c.)

3. *Present period* (phase ontozoïque, Bourguignat l.c.).

### 1. CAVE PERIOD.

This, which I consider, without doubt, by far the oldest of the existing shell-faunas of Menton, presents many interesting features. These extinct or subfossil mollusks, which were evidently then extraordinarily abundant, prove that the climate, in that remote age, was very cold and damp, similar to that which at the present day characterizes the peaks of from 3000 to 5000 feet altitude, which form here the backbone, as it were, of the Riviera—a good number of the species being actually identical, and most of the others of more or less allied forms. Scarcely any are the same as or even allied to the species which now live along the Riviera itself. Did these land-shells live before, after, or at the same time as Prehistoric Man, the Tiger, Rhinoceros, gigantic Stag, &c., whose bones have been discovered by Monsieur Rivière and others, in such great profusion in the celebrated Menton red caves ("balzi rossi"), quite close to which these mollusks are buried? For my own part, after a long and careful study on the spot, I am quite convinced that these shells do not belong to a more recent date, and I am unable to draw any immediate conclusions as to the age of my mollusks and Mons. Rivière's mammals &c.

The extinct shells which I found belonging to this period seem to me to be of two somewhat different ages; certainly they present considerably different aspects, as will be seen further on. The less ancient, apparently, of the two were undoubtedly contemporaneous with man, *Cervus elaphus*, &c.; the rest seem to me older, and may have lived at the same time as the more ancient inhabitants of these Caves, the Tigers, Rhinoceroses, &c.

All the localities where I found these extinct shells, with the one exception already mentioned, undoubtedly belong to one and the same age, be that what it may. They are all characterized at a glance, by the more or less red colour of the earth, containing numerous, usually rather small, stones; here and there, at the bottom

of this immense deposit, one occasionally comes across some large boulder, around and below which I found these subfossil shells, often in great profusion, sometimes incrustated in the rock itself, but generally fortunately preserved in the soft red earth which fills the crevasses of these enormous blocks of stone, in a condition as fresh and perfect as on the day they were buried.

There can, I think, be only one explanation of the really wonderful condition in which they are preserved: most undoubtedly the mollusks were at the time for the most part alive, actually living on the exact spots where they are still to be found. There they must have been suddenly buried as they lived, *in situ*, by the large deposits of this old Conglomerate, which one still finds heaped above them, of a thickness here of some 10 to 30 feet at least (oftentimes more), perhaps brought down by some enormous glacier from the high neighbouring Alps, by the St.-Louis gorge, which latter even may have been excavated as one finds it at present by this same action.

I ought to add that these subfossils are but rarely to be found on the surface itself: to discover them one has to dislodge the larger stones and excavate the soil.

Dr. J. Henry Bennet describes, in a most lucid way, this "Pleiocene conglomerate," in his interesting work 'Winter and Spring on the shores of the Mediterranean.' At page 39 he gives an account of the Geology of Menton, as also of the discovery of the bones of extinct wild beasts in these caves; he there estimates the thickness of this "conglomerate" in the neighbourhood at from 600 to 800 feet. At page 45 he speaks of the extreme probability of glacial action; but he is of the opinion of Dr. Nièpce, of Nice, that it was formed under the sea, before the Glacial period, and afterwards thrown up in its present position. The first view is doubtless correct; but the last certainly can not have been the case in the instances of which I am treating. These mollusks, interred immediately under this conglomerate, undoubtedly have never been subjected, in the most remote manner even, to the action of the sea.

I am quite of the opinion of Monsieur Bourguignat, that this conglomerate was formed very shortly after the Glacial period: the characters of these mollusks prove the climate to have been then very cold at the present sea-level; so the temperature must have been perfectly boreal on the summits of the neighbouring mountains. This would appear to be also the opinion of Prof. Issel (Appunti Paleont. Ann. Mus. Civ. Genova, vol. xiv. p. 11); he describes a similar deposit at Ventimiglia containing the bones of an extinct species of Elephant as belonging "al periodo Quaternario postglaciale."

The following deposits or beds (*A* to *D*) of this Conglomerate, without doubt of one and the same age, contain these subfossil mollusks:—

*A.* This was the only one of these deposits we could discover in France itself, all the others being in Italy: it is situated a few yards only from the frontier, a stone's throw from the "Pont St. Louis," about 50 metres above the sea, I should estimate; aspect nearly

due east; we found the shells here in the deep cutting of the high road under the larger boulders, about the level of the road, buried beneath approximately 20 feet of the Conglomerate; the mollusks were indubitably living here *in situ*.

*B.* Underneath the railway viaduct, almost exactly in front of the first cavern, something like 100 metres west of the tunnel, and about the same distance east of the Gorge St. Louis (frontier), about 20 metres above the sea. After passing through the arches, one finds before one a small amphitheatre, in which these shells can be found, here and there, in astonishing profusion. As a rule the Conglomerate here, under which they are buried, is of no great thickness, doubtless owing to the very steep incline of the slope; under one enormous rock, in especial, we collected a really wonderful number both of species and specimens. Our researches were so extensive here that we ended by dislodging the boulder itself, my friend having had a narrow escape of being crushed on the occasion.

The aspect is due south, and completely protected both from the north and east by the lofty surrounding cliffs in which the caves have been excavated at some remote period; the humidity of this spot must probably have been very considerable, owing to the small streams that doubtless trickled from the caves immediately above. The mollusks lived here also *in situ*.

*C.* Deposit, with a southern aspect, a little more to the east than the preceding and somewhat lower down, a few feet only above the sea, in a cutting of the new road which is being made along the seashore for working a stone-quarry, on the sea front of the tunnel. The Conglomerate, above the shells, was here about 20 to 30 feet in thickness. I am not sure that the mollusks lived on this spot.

*D.* Deposit, with a northern aspect, in a cutting of the railroad, about a quarter of an hour's walk to the east from the preceding, about a hundred yards east of the tunnel, quite cut off from all the previous localities by the peak, which here projects prominently into the sea, and which is surmounted by the tower and estate of Grimaldi, belonging to Dr. Bennet. This spot must have been very damp and cold, almost entirely shut in to the west and south by the peak, which easily explains the somewhat different "facies" of the extinct shells. Many of the species, abundant in the preceding deposits, are here very scarce, or altogether absent, whilst others, especially species of *Hyalina*, *Campylæa*, &c., are to be found in extraordinary profusion, evidently *in situ* as they lived, filling the crevasses of the larger blocks of stone, at a depth below the surface of about 15 feet. One or two of the forms also, as *Pomatias* and *Clausilia*, though closely allied, appear to be specifically distinct. We also discovered a few specimens of *Hyalina*, *Pomatias*, *Helix niciensis*, &c. a little more to the west, quite close to the perpendicular sides of the peak itself.

*E.* Bed, or deposit, near the sea and adjoining the stone-quarry, of doubtful age. The mollusks were here evidently not living *in situ*; the shells are very difficult to extract from the hard compact mass in which they are imbedded. Most of them belong to the same fauna

as the preceding; but more or less mixed up with them are others of a much more recent period, such as *Rumina decollata*, *Xerophila terveri*? (n. sp.?), &c. I was not able thoroughly to examine this locality, now much restricted by the works of the adjoining quarry; I found the work of extracting these subfossils too hard, a task which required hammer and chisel; an intelligent old man who serves as guide for the caves, however, extracted a good many for me.

*F.* Deposit, at one of the angles of the entry to the first cave, that nearest to Menton, southern aspect, and probably of somewhat less ancient age than all of the preceding. We were lucky enough to discover this narrow and very restricted deposit, containing subfossils, which we thoroughly explored, to the left as one enters within the first cave. I am consequently able to establish the fact that the (unfortunately only few) species we discovered here existed at the same time as some of the large mammals whose bones have been dug out of the interior of the cave in great quantities, and débris of which I found above, or mixed up with, these shells. We were unsuccessful in our efforts to discover any similar deposit round, or at, the other caves; possibly any one prepared to go to the expense of employing a few workmen might succeed in so doing. The earth in which they are preserved here is an ordinary-looking humus, similar to that in the interior of the cave, and without any trace of the red colour so characteristic of all the preceding. The mollusks most undoubtedly were living here *in situ*, doubtless sometimes climbing on the almost perpendicular rock in which the cave is excavated, at times hiding themselves beneath the large blocks of stone and in the crevasses at its base, where we found them. This spot, I am convinced, has not been affected by glacial action, as I take to be the case with all the preceding, which is easily explained by its being completely protected by the steep and lofty cliff immediately behind. These land-shells present a very different aspect from all the preceding, even in cases where the species appear to be identical, such as *Helix niciensis* and *Pupa quinqueidentata*; several species have not been found elsewhere at Menton, *Helix ramoriniana* especially. I take all the preceding deposits to belong probably to the phase éozoïque of Bourguignat, whilst this, together with most of the mammals discovered in the caves by M. Rivière, a list of which is given by Dr. Bennet (*loc. cit.* p. 56), would fall naturally into his phase dizoïque. I am inclined to think, too, that these shells of deposit *F.* were undoubtedly contemporaneous with the well-known fossil Man, found in one of these caves. In proof of this, I may mention that, besides the débris of bones of large mammals (*Cervus elaphus* &c.), but not of any Carnivora, I found immediately associated with them certain marine shells (*Patella*, *Trochus*, and *Cyclonassa*), all of which were also found with the fossil Man, a necklace, indeed, of the *Cyclonassa* being round his neck; these débris of marine shells were probably washed out of the interior of the cave by the small streams which then, as even now, doubtless trickled down the cave. I should mention that this small deposit was virgin soil, that it had not been disturbed or affected by the explorations of M. Rivière and others within the

cave. Within the cave itself I only detected two shells in original position; they fortunately further confirm my view, as they were attached to a small ledge against one of its walls, well inside the cave, and near its present floor. The bones have been dug out by M. Rivière &c. from a depth above them of about 6 feet. One was the species of *Trochus* already mentioned as found outside, the other a fine specimen of the distinct and well-marked variety of *Pupa 5-dentata*, which I found in abundance in deposit F, and which I shall hereafter describe as *P. (Torquilla) 5-dentata*, var. *speluncarum*.

I will conclude by pointing out that M. Rivière himself speaks of the land-shells he came across mixed up with the large bones of extinct animals in these caves; indeed it was this remark that first led me to search for these subfossils.

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From the memoirs of M. Bourguignat ('Note compl. sur quelques Mollusques et Mammifères découverts dans une Caverne près de Vence,' 1868, and 'Revue et Mag. de Zool.' 1877, pp. 11-17), and from those of Prof. Issel ('Delle Conch. nelle Breccie &c. della Liguria occidentale,' 1867), and of Mons. Bambur ('Journ. de Conchyl.' 1868, p. 265), as also from the present researches by Mr. Coombe Williams and myself, the conchological fauna of Menton, in the early part of the Quaternary epoch, appears to have been especially characterized by numerous striking forms of *Tachea* (some of which present some of the features of *Macularia* and seem to me to form a connecting link between the two subgenera), by species of *Campylæa* and *Fruticicola* (section *Zenobia*), by numerous species of *Hyalina* (*Euhyalina* and *Ægopina*), *Clausilia* (*Delima* and *Iphigenia*, sect.), *Pupa* (*Torquilla*, *Sphyradium*, *Orcula*, and *Pagodina*), by the two forms *Cyclostoma physetum* and *C. lutetianum* (quite distinct from *C. elegans*), *Pomatias*, sp., and the largest as yet known *Acme* and a new form, allied to it, which I am about to describe as a new genus ("*Renea*"); lastly, by species of *Daudebardia*, *Testacella*, *Limax*, &c.

Several of the genera, or subgenera, now abounding in the district do not seem to me to have existed then—*Xerophila*, *Cochlicella*, *Euparypha*, *Leucochroa*, *Succinea*, *Rumina*, and *Ferussacia*. It is true there are great doubts as to several of them. Issel mentions having discovered a unique subfossil *Ferussacia* at Capo Zoppa; Mr. Coombe Williams also found a single specimen, subfossil in his opinion, at Menton. Personally I doubt very much that either of the specimens belong to this early period; I think, at the oldest, they belong to the zone of *H. paretiana*. The same remark applies to *Rumina*, of which I found one or two fragments in doubtful position, and which Issel also mentions in his above cited work. *Xerophila* appears considerably more doubtful, even, than either of the preceding. Bourguignat mentions a species from the cavern of Vence. I myself found numerous specimens of various new species (allied to *X. terveri*), not only immediately associated with *H. pare-*

*tiana*, but also in close proximity to most of the deposits *A* to *E*; but though fragments were very numerous all round, I could never succeed in finding a single bit even undoubtedly associated with these subfossils, which I here attribute to the "phases éozoïque et dizoïque."

## 2. INTERMEDIATE PERIOD.

Under this heading I comprise a certain number of species, characterized by the remarkable gigantic *Helix paretiana*, Issel, which can be found, here and there, all along this part of the Riviera, and which most certainly, in my opinion, are of a more recent age than the preceding; most of them are closely allied forms to those still found living in this submarine zone.

This zone of *H. paretiana* requires still further investigation, a matter of considerable difficulty, as the mollusks do not appear as yet to have been found actually *in situ*. Those I found were evidently isolated washed-down specimens, mostly in bad condition, and incrustated in the rock, from which it was often impossible to extract them. At Cape Mortela, indeed, where they occur at a considerable depth (perhaps some 40 or 50 feet below the surface), they are preserved in better condition in the comparatively soft "Couche Marneuse." Immediately above them here, in perfectly similar deposit, occurring at a depth of, approximately, 10 feet or so, can be found in profusion present-existing species, such as *H. aspersa*, *H. vermiculata*, *H. cespitum*, *Pupa multidentata*, *Rumina decollata*, *Cyclostoma elegans*, &c. The most characteristic forms I found immediately associated with *H. paretiana* were *Hyalina olivetorum* and *H. herculæa*, a variety of *Rumina decollata* much stouter and larger than the existing form, one or two species of the group *Xerophila*, allied to, but quite distinct from, *X. cespitum*, which is found in profusion immediately above, and two species of the group *Tachea*, &c. I think this "Couche Marneuse" at Cape Martela clearly proves *H. paretiana* and its associated mollusks to have immediately preceded the present fauna, without any very marked break, either of change in the climate or otherwise.

## 3. PRESENT PERIOD.

This I should divide into two well-marked zones, having but very few species in common, *Pupa quinquedentata* being a marked exception—Submarine and Subalpine Zones.

*A. Submarine Zone.*—Especially characterized by species of *Xerophila*, *Macularia vermiculata*, *Leucochroa candidissima*, *Rumina decollata*, *Ferussacia* and *Cæcilianella* spp., *Clausilia solida*, &c. It is, perhaps, worthy of notice that I found the common species of *Pomatia*, *Xerophila*, &c., almost without exception, of larger dimensions than those recorded as "major" in Pfeiffer's Monogr.

*B. Subalpine Zone.*—On account of my bad health I was unable to explore the higher elevations, where many interesting forms doubtless still remain to be discovered. My friend Coombe Williams was good enough to make several expeditions to the summits of the neigh-

bouring peaks, the "Grand Mont" (4475 ft.) and the "Berceau" (3575 ft.), which were attended with very marked success. A considerable number of the subfossil species which I found in the deposits of my so-called "Cave period," have been discovered living at high elevations in the surrounding Alpes Maritimes, both by Mons. Bourguignat and now by Mr. Williams—such as *H. olivoluta*, *H. diæga*, *H. niciensis*, *Pupa obliqua*, *Hyalina maceana*, *Clausilia punctata*, *virinata*, and *bizarellina*, &c.; doubtless many of the others will eventually be also discovered.

When one attains a height above the sea of approximately 1600 feet or so, *Clausilia solida* and *Rumina decollata* appear to reach their limit, and *Zonites algirus*, *H. obvoluta*, &c. appear for the first time. A little higher still occurs a fine stout variety of *H. niciensis*, *H. (Campylæa) cingulata*, var., and *H. nemoralis*; here, too, a very large, smooth and rounded variety of *H. cespitum* takes the place of the small, compressed, striate submarine variety (or distinct species?); *H. cemenclæa* the place of *H. anconæ*; *Hyalina eugyrus* and *H. maceana* the place of the very distinct species of *Hyalina* abundant near the sea all along this part of the Riviera. Approaching the peaks of these Alps, one meets with various forms of *Fruticicola* (section *Zenobia*), *Pomatias patulum*, *Torquilla avenacea* and *secale*, gigantic varieties of *H. aspersa* and *H. nemoralis*, a thin, very variable, and poorly-coloured variety of *H. niciensis* closely resembling the subfossil variety from the "Balzi Rossi," *Cyclostoma physetum*, &c.

TESTACELLA WILLIAMSIANA, n. sp. (Plate XIII. fig. 1.)

*T. crassa, cretacea, subplanata, ovata, subemaciata, ad basim æqualiter anguste attenuata rotundata, supra stris incrementi concentricis valide ac subconfertim sulcata; apex exacte centralis, fere rectus, subverticalis, acute prominens; columella crassa, haud plana, perarcuata, superne conspicue intorta, inferne obsolete truncata; peristoma leviter arcuatum; superne, ad apicem terminans, lunula triangularis ac profunde incisa existat.*

Long. 5, diam.  $2\frac{3}{4}$  millim.

Of this small species I only found seven specimens, all slightly differing in size (ranging from 4 to  $5\frac{3}{4}$  millims.); Mr. Coombe Williams, after whom I have named the species, also found about six or seven, which, unfortunately, I have not been able to examine. We only found the species in Deposit B, nowhere else. It is next allied to *T. bisulcata*, Risso, admirably figured by Bourguignat in his 'Moll. Alpes-Marit. publiés par Risso,' from which it is well characterized by its peculiarly regular and attenuately compressed ovate form, by the perfectly rounded, instead of angulate, base, by the slightly though distinctly more arcuate peristome, by the more arcuate and twisted columella less distinctly truncate at base, but above all by the remarkable, almost vertical, and acutely prominent apex, perfectly central, instead of being a good deal everted, and



forming a more distinct and more triangular lunule than, I believe, in any other species of the genus; the back, too, is more regularly, closely, and deeply sulcate.

Type, Indian Museum, Calcutta; also in coll. J. R. Bourguignat and Coombe Williams.

*DAUDEBARDIA ISSELIANA*, n. sp. (Plate XIII. fig. 2.)

*T. umbilicata, applanata, sat fragilis, nitidissima, pallide cornea; apex paululum lateralis; anfract. 3, haud compressi, celerrime crescentes, vix convexiusculi, sutura impressa separati, ultimo valde dilatato; apertura transverse oblonga, oblique elongata (haud "rotundato-ovalis" sicut D. rufa), margine externo lente subrotundato, marginibus callo tenui junctis, columellari incrassato, subrecto, ad basim subangulato.*

Long.  $4\frac{1}{4}$ , lat.  $2\frac{9}{10}$  millim.

Compared with the three German species, *D. isseliana* is nearest *D. rufa*, from which it can be at once distinguished by its greater proportional breadth, caused by the much more rapidly increasing, slightly less convex whorls (apparent in all three, not only in the last one); the apex is less central, the texture a trifle stouter and more polished; the aperture, instead of being ovally rounded, is regularly transversely oblong, the outer margin being scarcely arcuate, instead of markedly so (that is, much more gradually rounded); and the columellar much less oblique, thicker, and altogether more prominent, more subangulate at its base. *Daud. nubigena*, Bourg., from Algeria (Moll. nouv. &c., xi. & xii. fasc. pl. iv.), is even nearer; but is a less elongately produced shell, less appressed, the aperture more rounded and not subangulate at the columella, which is more oblique and less prominent. This species appears to have been very rare: with difficulty I found, in deposit *B* only five specimens, Mr. Williams obtaining about the same number.

Type, Indian Museum, Calcutta; also in coll. J. René Bourguignat and Coombe Williams.

*VITRINA (OLIGOLIMAX)*, n. sp.

A single specimen, from deposit *B*, was all we could find of this interesting form. I think it better under these circumstances not to describe the species; I will only mention that the narrow perforation is quite distinct.

Unique specimen in Indian Museum, Calcutta.

*LIMAX AGRESTIS*, Linnæus.

Not uncommon in the submarine zone.

*LIMAX*, sp.

We found many hundred subfossil shells of this genus in deposits, evidently belonging to at least four or five different species; one common, fine and well-marked form measures, long. 10, lat.  $4\frac{3}{4}$ , crass. 2 millim.

*LIMAX*, sp. ?

Mr. Coombe Williams found a single specimen of a small black *Limax* on the Berceau at a great elevation.

*LIMAX* (*KRYNICKILLUS*) *NICIENSIS*, Bourg.

Creamy yellow, mottled with pale brown (not very closely); sole of foot and sides whitish; head and neck concolor, fulvous yellow; orifice posterior; crest rather distinct, also posterior rugosities and circular striation of buckler, mucous white.

Not uncommon near the village of Grimaldi. Mr. Williams also found it at 3000 feet on the Berceau Mountain.

*LIMAX* (*KRYNICKILLUS*) *MENTONICUS*, n. sp.

Sole of foot light brown; orifice posterior; head and tentacles dull claret-colour, very sparsely speckled with black; buckler unusually long, rich brown, closely and minutely speckled with black, circular striation apparently running in two contrary directions; posteriorly nearly smooth; extreme caudal end acutely pointed, of a brighter (speckled) brown colour.

Common near Menton. This Slug is very active.

*MILAX GAGATES*, Drap.

A common Menton Slug.

*MILAX CARINATA* (?), Risso.

A rather uncommon species, from the Submaritime zone.

*MILAX*, sp.

We found, subfossil, numerous specimens of various species of this genus in deposits.

*MILAX*, n. sp. ?

Concolor, fulvous-yellow, minutely speckled with grey; sole of foot faint yellowish, undivided; tentacles inky black; buckler bilobed posteriorly; crest distinct; orifice slightly posterior; line of "limacelle" rather indistinct.

Village of Grimaldi.

*ZONITES ALGIRUS*, Linnæus.

Rather local near Menton; only found at a level of 2000 feet or so, especially in the neighbourhood of the higher-level road to Nice, round the village of Roquebrune &c. I also found a single perfect specimen on the side of the road round Cape St. Martin, buried a few feet below the surface; I imagine it had been washed down from the mountains behind. I saw no trace of this species subfossil, not even in the upper stratum of Cape Mortela, where I should have expected to find it. The Menton form is more distinctly subangulate at the periphery than usual.

*HYALINA (RETINELLA) HERCULÆA*, Rambur (Journ. de Conchyl. 1868, Monaco, and 1869, pl. ix. fig. 7, as *Zonites* sp.).

I only found a single, fortunately very perfect, specimen of this rare, well-marked, and very distinct species: I obtained it in the lower stratum of the "Couche Marneuse" at Cape Mortela, zone of *H. paretiana*. As Mr. Bourguignat's collection, though containing most of Rambur's and Issel's Ligurian subfossil types, did not possess this interesting form, I had much pleasure in presenting him with the above unique specimen.

*HYALINA (RETINELLA) OLIVETORUM*, Hermann (? var. *leopol-diana*, Charp, MS.).

A nice case arises here, with regard to priority of the subgeneric name; which should it be—*Retinella*, Shut. MS., Fischer, Not. Malac. ii. 1878, or *Ægopina*, Robelt, Cont. Rossm. Icon. 1878? I have nowhere found this species living in this part of the Riviera, where its place has been apparently taken by *Zonites algirus*; in former years it evidently abounded: it occurs in deposits *A*, *B*, *C*, *E*, and by thousands in deposit *D* (the subgenus not being represented in deposit *F*). I found it also, immediately associated with *H. paretiana*, all along the coast, from Monaco to Cape Mortela, at least one other closely allied but distinct species being found with it, only of much rarer occurrence, *Hy. herculæa* of Rambur.

The largest form (true *Hy. olivetorum* fide cl. Bourg.) was especially abundant in deposit *D*; it closely resembles specimens I possess from Lucca, the dilatation of the last whorl, its slight compression at the periphery, and shape of the aperture, lunately oval, being almost exactly similar; the spire in the Menton specimens is more depressed, slightly less convex, and markedly more central; the umbilicus a trifle less perviously open.

Alt.  $15\frac{1}{2}$ , diam. 28; apert. alt.  $12\frac{1}{2}$ , lat. 13 millim. From deposit *D*.

Alt.  $17\frac{1}{4}$ , diam. 30; apert. alt.  $13\frac{1}{4}$ , lat.  $14\frac{1}{8}$  millim. Specimen from Lucca.

Var. *MACROBIOTUS*, nov. (? *Hyalina macrobiota*, n. sp.).

A very characteristic and distinct form, from deposits *A*, *B*, and *D*. Easily recognized from type form by the more convex whorls, the last one more abruptly deflected, more convex at base, and especially by its being notably less expanded, thus causing the spire to be markedly less central; the umbilicus is very similar; the aperture less compressed and higher in proportion, the columellar margin being less oblique. The differences can be easily seen in young as well as in mature specimens.

Alt.  $15\frac{1}{2}$ , diam.  $26\frac{1}{4}$ ; apert. alt. 12, lat. 12 millim. From deposit *D*.

Subvar. *SUBINCERTA*, nov.

A very curious small form, of which I found some half dozen specimens in deposits *B* and *C* only. The spire is unusually ele-

vated, quite central, the six and a half whorls moderately convex, and increasing very gradually and regularly, the last one very abruptly deflected, not dilated near its termination, as in the preceding, more convex at its base; umbilicus a good deal less open; aperture perfectly rounded, instead of laterally produced, with columellar margin nearly straight, instead of very oblique.

Alt.  $13\frac{1}{4}$ , diam.  $19\frac{3}{4}$ ; apert. alt. 10, lat. 9 millims. From deposit C.

HYALINA (RETINELLA) LIKES, n. sp.

*T. depressa*, superficie late ac aperte umbilicata, supra distincte subregulariterque striata; anfractus  $5\frac{1}{2}$ , vix convexi, ultimo rapide crescente, late dilatato, haud descendente, ad peripheriam subangulariter compresso, ad basim fere applanato, vix convexo; apertura paululum compressa, lunato-ovata, margine columellari reflexo, perobliquo.

Easily distinguished from all varieties of *Hy. olivetorum*, in especial by the shallow, instead of solariform, umbilicus; the last whorl also is much more narrowly compressed, flatter at base, and not deflected; the whorls are fewer, the spire much more depressed, with the sculptured striae more distinct. Of rare occurrence in deposits A and B, abundant in D; unfortunately always in bad preservation, and apparently the greater number young specimens. I also found it by no means rare at Cape Vieille (? zone of *H. paretiana*).

Alt. 9, diam. (prox.) 15; apert. alt. (prox.) 7, lat. 8 millim. From deposit A.

Alt.  $5\frac{3}{4}$ , diam. 11 millim. Common form, ? young, from deposit D.

Type, Indian Museum, Calcutta; also in coll. of M. J. R. Bourguignat.

HYALINA GLABRA, Studer.

*T. spira paululum elevata, peranguste perforata, cornea, nitidissima, supra (sub lente) delicate striatula; anfractus  $5\frac{1}{2}$ , haud convexi, ultimo rapide crescente, ad peripheriam subangulato, basi vix convexo; apertura perampla, lunato-ovata, margine externo producto, gradatim rotundato, margine columellari reflexo, subrecto.*

Alt.  $7\frac{3}{4}$ , diam.  $14\frac{1}{8}$ ; apert. alt. 6, lat.  $7\frac{3}{4}$  millim.

This species was very rare in deposit C, did not occur at all in A, B, E, or F, but was very common in D, unfortunately always in bad preservation and more or less broken. It appears to vary scarcely at all as regards elevation of the spire, distinct but very narrow perforation, and the large laterally produced aperture. I did not find any recent specimens; nor is it recorded from the deposit by Risso.

Type, Indian Museum, Calcutta; also in coll. of MM. Bourguignat and Williams.

HYALINA BLONDIANA, Bourg. (Desc. Moll. Alpes-Marit. 1869, near Grasse, as *Zonites*, sp.; alt. 6, diam. 15 millim.).

Moderately abundant in the vicinity of Menton, agreeing exactly with the original description; the difference in height, recorded below, is perhaps owing to our having different methods of measure-

ment. I take mine from the base of the outer margin of aperture to the apex. It is quite specifically distinct from the following allied species, which take its place at 3000 feet or so.

Alt. 7, diam. 15; apert. alt. 6, lat.  $7\frac{1}{2}$  millim. Specimen of seven whorls, from Menton.

HYALINA EUGYRUS, Stabile (Moll. Lugano, p. 51, 1859; fide cl. Bourg.=*H. cellaria*, var. *villæ*, Stabile, Moll. Piémont, 1864, =*H. villæ*, Mortillet, not of Deshayes, Giorn. Mal. 1853).

I am indebted for this identification to M. Bourguignat. Mr. Williams found the species rather scarce on the "Berceau" and "Grand Mont," from 2500 to 4000 feet. It has six whorls of very fragile substance, spire almost flat, umbilicus very open and shallow, periphery more compressed than in the preceding, columella much more oblique, &c.

Alt.  $5\frac{1}{2}$ , diam. 13; apert. alt. 5, lat.  $6\frac{1}{2}$  millim.

HYALINA BLAUNERI, Shuttl. (Mitth. Ges. Bern, 1843, Corsica; =*Helix lucida*, Drap., var. *compressa*, Dumont & Mortillet, Moll. Savoie, 1852).

An abundant form in the submarine zone; it does not appear to occur at any considerable altitude, at least near Menton; we found nothing like it subfossil. Young specimens bear perhaps a faint resemblance to *Hyalina fodereana*, Bourg. MS. I very much doubt if *H. blautneri* can be specifically separated from *H. lucida*; I have thought it best to do so temporarily. The present form is quite distinct from a more openly umbilicate shell from Lucca, which I received as "*H. lucida*," but which is nearer *H. blondiana*, indeed scarcely separable!

Alt.  $5\frac{3}{4}$ , diam.  $12\frac{1}{4}$ ; apert. alt.  $4\frac{3}{4}$ , lat. 6 millim. Submar. zone, Menton.

Animal entirely of a dark slate colour; sole and sides of foot of a trifle more greenish hue.

HYALINA MACEANA, Bourg. (*Zonites maceana*, Bourg. Descr. Moll. Alpes-Marit. 1869; near Grasse; alt.  $4\frac{1}{2}$ , diam. 13 millim.)

A well-marked and most distinct species, unmistakable for any other with which I am acquainted. Subfossil, it abounds at Menton, in deposits A, B, C, D; we found a single specimen in F. It occurs here and there along the coast as far as Monaco. Mr. Williams found it rather scarce, living on the "Grand Mont," at nearly 4000 feet.

Alt. 5, diam. 12; apert. alt.  $4\frac{1}{2}$ , lat.  $5\frac{1}{2}$  millim.

Var. PLANORBIODES, nov. (an potius *Hyalina planorbioides*, n. sp.?).

A singular *Planorbis*-like variety with sunken spire; the last whorl increasing more rapidly in proportion, more compressed at the periphery and (near the aperture) raised above the preceding

whorl in a very remarkable way; umbilicus narrower, &c. I only found a few specimens in deposit *D*.

Diam.  $9\frac{1}{2}$ , alt. apert.  $3\frac{3}{4}$ , alt.  $3\frac{1}{2}$  (from apex to base of aperture) millim.

Type var. Indian Mus. Calcutta; also in coll. Williams.

#### HYALINA FODEREANA, Bourg. MS.

I will not attempt to describe this species, as it is too close to many species of the group of *Hyalina lucida*, *blauveri*, &c., several of which I do not possess for comparison; I will only say that the species is everywhere abundant in deposits *A*, *B*, *C*, *D*, with the preceding, from which it is undoubtedly quite distinct. We did not find recent specimens of this form.

Alt.  $5\frac{1}{6}$ , diam.  $12\frac{1}{2}$ ; apert. alt.  $4\frac{3}{4}$ , lat. 6 millim.

M. Bourguignat informs me that I sent him some recent specimens from Menton; but they were certainly not identical with this subfossil species.

#### HYALINA, sp.?

A small species of five whorls, apparently full-grown, of which I found some half dozen specimens in deposit *F* only. It is a little more narrowly umbilicate than young *Hyalina maceana* of the same size; the whorls increase very gradually and regularly, the last one not being dilated.

Alt.  $3\frac{1}{3}$ , diam. 7 millim.

Indian Museum, Calcutta, only.

#### HYALINA MENTONICA, n. sp. (Plate XIII. fig. 3.)

*T. parva, spira elevata, anguste perforata, subobsolete striatula, cornea, nitida; anfract. 6, convexiusculi, regulariter pergradatimque crescentes, ultimo paululum compresso, prope aperturam angusto (haud dilatato), basi convexo; apertura fere rotunda, marginibus regulariter rotundatis ac subincrassatis.*

Alt.  $3\frac{1}{6}$ , diam.  $5\frac{3}{4}$  millim.

A pretty little species, quite unlike any I know, and also unknown to M. Bourguignat. Mr. Williams found one or two recent specimens at Sainte-Agnès, about 2500 feet. It is a true *Hyalina*, and does not belong to *Vitrea*; the very narrow last whorl, not dilated at all, the narrow perforation, rounded aperture, elevated spire, &c. well characterize it. The figure is not good, and the shell has been since accidentally broken.

Type, Indian Museum, Calcutta.

#### HYALINA (VITREA) TENEBRÆRIA, Bourg. MS.

I will not attempt to describe this small form of a most difficult group, for which I have not at the moment the proper material available. It is an imperforate species, with remarkably excavated base. It was rather scarce (subfossil) in deposits *A*, *B*, and *D*. M. Bourguignat informs me he possesses recent specimens of the species from a grotto near Grasse.

*ARION HORTENSIS*, Müller.

A few specimens from just outside the town.

*ARION AUSTENIANUS*, n. sp.

I am indebted to M. Bourguignat for the information that the above is a new form. I found a few specimens near the village of Grimaldi, at about 1000 feet elevation.

*LEUCOCHROA CANDIDISSIMA*, Drap.

A small form is extremely abundant throughout the submarine zone; specimens more or less scalariform (that is, with the whorls subdetached) are by no means rare; it is as often narrowly rimate as imperforate. I was astonished not to find the genus at all a little further eastwards at Alussio.

Alt.  $12\frac{1}{2}$ , diam.  $16\frac{1}{2}$  millim.

*HELIX (GONOSTOMA) OBVOLUTA*, Müller.

Not uncommon in deposits *A*, *B*, *C*, *D*, varying in the more or less open umbilicus. I found a single subfossil specimen at Roquebrune, zone of *Helix paretiana*; we did not find it living ourselves in the neighbourhood; but there were recent specimens in the Museum from the Turin valley (some 2000 feet). It is also recorded by Risso.

Alt.  $6\frac{3}{4}$ , diam. 14 millim. Deposit *A*. Umbilicus very open.

Alt. 6, diam.  $12\frac{1}{4}$  millim. Deposit *D*. Umbilicus less open.

*HELIX (PATULA) ABIETINA*, Bourg. (Malac. Algér. 1864).

Rare, subfossil, in deposit *B* only.

Alt.  $2\frac{1}{4}$ , diam. 6 millim.

*HELIX (PATULA) RUPESTRIS*, Drap.

Rather scarce towards the base of the Grimaldi Hill; also subfossil in deposit *F* only.

*HELIX (PATULA) PYGMÆA* (?), Drap.

Not uncommon in deposit *B*. Unfortunately I do not know the species of this group sufficiently well to be sure of my identification.

*HELIX (TACHEA ?) PARETIANA*, Issel (Att. Acad. Torino, 1867; Verezzi, alt. 32, diam. 42 mill. = *H. monacensis*, Rambur, Journ. Conchyl. 1868 and 1869, Monaco).

Here and there we found remains of this gigantic extinct *Helix* all along this part of the Riviera; but in the "Couche marneuse" of Cape Mortela only were the specimens sufficiently well preserved to be worth keeping; and even there we only found one or two poor specimens, until my friend got some quarrymen to lower him, with a rope, some way down one of the remarkable clefts or chasms (many hundred feet often in depth) that everywhere cut through this "Couche marneuse." Unfortunately he took such a fancy to this fine *Helix* that he would not touch any other shell during his descent,

when he obtained more than a dozen magnificent specimens, though I was most anxious to increase my knowledge of what were the undoubted associates of this remarkable mollusk. A proper and thorough investigation of this deposit at Cape Mortela still remains for some future naturalist. It was a little too far for my now very limited powers of walking, but is not so for any one in fair ordinary health, living in the East Bay. I am convinced this species has nothing to do with the subgenus *Macularia*, with which, at first sight, it shows some affinity; I think it nearly certain it was a true *Tachea*. I could discover no trace of this species in deposits A to F.

Alt. 29, diam.  $41\frac{3}{4}$ . A common depressed form from Cape Mortela.

Alt. 34, diam. 46. Cape Mortela.

Alt.  $31\frac{1}{2}$ , diam.  $41\frac{1}{2}$ ; apert. alt. (cum perist.)  $23\frac{1}{2}$ , (sine perist.) 19, lat. (cum callos. colum. ac perist.)  $25\frac{1}{4}$ , (sine præced.) 18 millim.

This specimen, from Cape Mortela, has two broad brown bands (the lower one the broader) on the two antepenultimate whorls, four (apparently more or less interrupted) on the last whorl; the two apicals are unusually developed and prominent, horn-colour, and perfectly smooth.

#### HELIX (TACHEA?) MENTONICA, n. sp.

*Helix vermicularis*, Issel, Con. Cav. Ossif. Liguria, figs. 7, 8, 1867, not of Bonelli.

*Testa ad* "Helix vermiculariam, Bonelli," et "H. paretianam, Issel," *affinis: imperforata, subgloboso-conoidea, vix solida, oblique irregulariter striata, ultimo anfractu valide malleato; albida, zonulis pervariis circumcincta interruptis aut continuis, sæpe perspicuoribus prope peristoma; spira plus minusve conico-elevata, apice obtuso, lævigato; anfract.  $5\frac{1}{2}$ , convexi, regulares, sutura distincta separati, ultimo majore, tumido ac rotundato, ad aperturam abrupte descendente; apertura ampla, obliqua, subovalis, marginibus callo castaneo ac valido junctis; peristoma castaneum, percrassum, expansum, intus incrassatum; margo columellaris lævis, adpressus, late reflexus.*

Diam.  $32\frac{1}{4}$ , alt.  $23\frac{1}{4}$ ; aperturæ lat. (cum peristomate ac callo columellari) 19, alt.  $17\frac{1}{2}$  millim.

Subvar. *minor*. Diam.  $29\frac{1}{2}$ , alt. 21; apert. lat. 17, alt.  $16\frac{1}{2}$  millim.

This species abounded in deposits A, B, D (in especial), and E, mostly in very bad condition, so much so that out of many hundred specimens which I obtained and carefully examined I have only obtained a few perfect specimens. It is undoubtedly the *Helix vermicularia* of Issel, typical specimens of which I examined at Genoa, but differs so much from typical Turin specimens of the true *H. vermicularia*, Bonelli, that I am unable to accept the identification.

The species varies enormously, as, I find, do most mollusks of which large series occur in a circumscribed space. It is not closely



allied to *H. nemoralis*, *H. williamsiana*, and other undoubted species of *Tachea*, but shows great affinities to *H. paretiana*, of which it might almost be described as a miniature form, while *H. ædesima* is a depressed form with peculiar aperture, more vivid coloration, and umbilicus scarcely covered with the columellar callosity, and *H. beneti* is a dwarf convex form with small aperture.

Type, Indian Museum, Calcutta; also in collection of MM. Bourguignat and Coombe Williams.

*HELI* (*TACHEA*?) *ÆDESIMA*, n. sp.

*Testa ad præcedentem peraffinis, sicut H. lucasi, Deshayes, ad H. lacteam, Müller: imperforata, aut plus minusve subrimata, depresso-globosa, sat fragilis; obsolete malleata et subregulariter striata, striis delicatis obliquis; albida, zonulis variis circumcincta; spira depressa, parum elevata, ultimo anfractu paululum compresso, lente descendente, subtus ad regionem columellarem paululum excavato; apertura obliqua, transverse oblonga, superne contracta, marginibus callo brunneo junctis; peristoma vivide coloratum, superne subrecte productum, pergradatim rotundatum, ad basim abrupte angulatum, ac tuberculo subobsoleto munitum; margine columellari perobliquo, contortulo, subrugoso, locum umbilicalem callo tenui vix tegente.*

Diam.  $27\frac{1}{2}$ , alt. 9; apert. lat.  $15\frac{1}{2}$ , alt.  $13\frac{1}{2}$  millim.

Type, from deposit F, Indian Museum, Calcutta; also in collection J. R. Bourguignat.

Var. *COLORATA*, nov.

*Varietas major, sat tenuis, sæpe subrimata, vix malleata, zonulis latis ac continuis ornata.*

Diam.  $31\frac{1}{2}$ ; apert. lat.  $18\frac{1}{2}$ , alt. 16 millim.

Type var., from deposit D, Indian Museum; also in collection of Coombe Williams.

Var. *CRASSIOR*, nov.

*Varietas major, solidior, imperforata, valde malleata, ordinarie zonula unica circumcincta, apertura minus contracta, margine externo magis rotundato.*

Diam. 32, alt. 21; apert. lat. 19, alt.  $16\frac{1}{2}$  millim.

Type var. from deposit E, Indian Museum, Calcutta; also in collection Bourguignat and Coombe Williams.

This is a very remarkable form, bearing much the same relation-ship to *H. mentonica* as *H. lucasi* to *H. lactea*. It is much more depressed, with a remarkable aperture, the columella (much twisted and with a small tubercle at base) being bent inwards, so as to contract the body portion of the aperture; the external margin is straightly produced, very gradually rounded, in this differing from every other species of *Tachea* I know (*H. mentonica*, *H. williamsiana*, *H. nemoralis*, &c.), in all of which it is more or less rapidly rounded. Unfortunately, though I found a great number of spe-

cimens, I have not been able to obtain a single one in even fair condition; they crumble at a touch. The best-characterized were four specimens of a form which I found only at the entry to the cave, deposit *F*; one of these I have taken as my type. Var. *colorata*, always in bad condition, was tolerably plentiful in deposits *A* and *D*. Var. *crassior*, from deposit *E* only; I am by no means sure that this form is specifically identical with typical *H. œdesima*. The species did not occur at all in deposit *B*.

HELIX (TACHEA?) BENNETIANA, n. sp.

*Testa* ad *H. mentonicam affinis, sed haud difficile distinguenda; imperforata, globosa, paululum conoidea, solida; rugose irregulariterque striata, valide malleata; albida, zonulis perindistinctis circumcincta; spira parum moderate elevata, apice subacuta, lævigata; anfract. 5½, convexiusculi, sutura distincta separati, ultimo majore, ad peripheriam paululum compresso, subito descendente, subtus convexo; apertura contracta, parva, subrotundata, lunato-ovata, marginibus callo brunneo junctis; peristom. castaneum incrassatum, expansum; columellaris callosa, late adpressa, subrugosa, paululum contortula.*

Diam.  $23\frac{1}{4}$ , alt. 17; apert. lat.  $14\frac{1}{2}$ ; alt.  $11\frac{3}{4}$  millim.

A still smaller form, closely allied to the preceding, easily recognized by its small aperture and convex base &c. It was only found in deposits *B*, *C*, and *E*, and was comparatively rare; the coloration, in every specimen found, was much broken up, scarcely showing traces of bands. I have named this species after Dr. J. H. Bennet, who may be called the "Discoverer of Menton," whose estate of Grimaldi, with its beautiful and well-known gardens, always thrown open to visitors, surmounts these bone-caves, and to whose kind assistance I am deeply indebted for much valued aid and sympathy in collecting my material for this paper.

Type, Indian Museum, Calcutta; also in collection MM. Bourguignat and Williams.

HELIX (TACHEA) WILLIAMSIANA, n. sp.

*Testa* ad *H. nemoralem, Linn., affinis; imperforata, conico-globulosa, percrassa, polita, nitida; confertim ac regulariter oblique striata, ultimo anfractu distincte malleato; albido-lactea, fere omnino late eleganterque unizonata, zonula castanea ad apicem videnda (speciminibus raris subtus duabus aliis zonulis latis circumcinctis); spira elevata, apice subacuta, lævigata; anfract. 5½, convexiusculi, celeriter crescentes, sutura distincta separati, ultimo ventricosus-subrotundato, subabrupte descendente, subtus vix convexo, subapplanato; apertura subovalis, parum obliqua ac lunata, marginibus callo tenui castaneo junctis; peristom. extus ac intus vivide castaneo coloratum, supra fragile, vix incrassatum, infra expanse reflexum; columellaris sicut in *H. nemorali*, sed callo validiore locum umbilicalem tegente.*

Diam.  $30\frac{1}{2}$ , alt. 22; apert. alt. 16, lat.  $18\frac{1}{2}$  millim.

## Var. SUBNEMORALIS, nov.

*Ad H. nemoralem magis affinis; spira depressa, ultimo anfractu compresso, subtus applanato, gradatim descendente; apertura oblonga, producta, minus alta, margine externo gradatim rotundato, peristomate perlate reflexo.*

Diam.  $28\frac{1}{2}$ , alt.  $20\frac{1}{2}$ ; apert. (cum perist. ac callositate colum.) alt. 15, lat.  $17\frac{1}{2}$  millim.

Type var., Indian Museum, Calcutta.

A rather uncommon, more depressed variety, from deposit B only; generally ornamented with a single very vivid broad band traceable along the suture of the last two or three whorls.

I need scarcely say I have named this species after my friend Mr. T. B. Coombe Williams, whose name occurs so frequently in these pages.

## Var. SPANIAS, nov.

*Sat tenuis, globosa, depressa, vix nitida aut polita; irregulariter striata, distincte malleata; indistincte zonata, zonulis subobsoletis; spira depressa, ultimo anfractu ventricosus-rotundato, lente gradatimque descendente, subtus convexo; apertura ampla, subovalis, peristomate parum reflexo, locum umbilicalem callo tenui tegente.*

Diam.  $27\frac{1}{2}$ , alt. 19; apert. lat.  $16\frac{1}{2}$ , alt. 15 millim.

This well-marked form, with more convex base and less solid texture &c., regarded by M. Bourguignat as a distinct species, was rather uncommon; I found it only in deposits A, B, C.

Type var., Indian Museum, Calcutta; also in the collection of M. Bourguignat.

## HELIX (TACHEA) NEMORALIS, Lin.

Not found at all in the submarine zone, but common enough as soon as one reaches an altitude of 1500 to 2000 feet, up to the very summits of the mountains (4000 feet), where it is of very thin texture; varieties of 4 to 5 or a single band on the last whorl appear commonest. I found four or five specimens, in poor preservation unfortunately, in the "Couche marneuse" of Cape Mortela, from apparently the zone of *H. paretiana*; they are probably a variety of *H. nemoralis*, though apparently differing somewhat.

Diam.  $26\frac{1}{2}$ , alt. 21; apert. lat. 15, alt. 14 millim. From "Grand Mont," at 4000 feet.

Diam. 27, alt. 20; apert. lat. 16, alt.  $14\frac{1}{2}$  millim. From "Berceau," at 3200 feet.

Diam. 22, alt. 16; apert. lat.  $13\frac{1}{3}$ , alt.  $11\frac{1}{2}$  millim. From near Monaco.

Diam.  $24\frac{1}{3}$ , alt.  $18\frac{1}{2}$ . Subfossil, from Cape Mortela.

Measurements below from Pfeiffer, Mon. i. p. 276:—

Diam. maj. 25, min. 21, alt. 15 millim.

## HELIX (POMATIA) ASPERSA, Müller.

The variation in size, according to the altitude at which this

species is found near Menton, is interesting, as the different forms seem to be fairly constant in their several localities. On the sunny hill of Grimaldi a true dwarf form is abundant, living with a similar dwarf variety of *H. vermiculata*. Round Menton generally, and up to a considerable height, it is an ordinary form; near the summits of the mountains, at 3000–4000 feet, it is a gigantic tumid form, not very common, reminding me very much of Algerian specimens. I could see no trace of the species in the lower strata of the “Couche Marneuse” of Cape Mortela (zone of *H. paretiana*); a rather large form abounded, however, at about 5 feet or so below the surface, with other common existing shells of the country.

Subvar. *nana*. Alt.  $21\frac{1}{2}$ , diam. 25 millim. Found only on the hill of Grimaldi.

Subvar. *alticola*. Alt. 43, diam.  $46\frac{1}{2}$  millim. Summits of the neighbouring Alps, and a similar, somewhat smaller form from near the surface of the “Couche marneuse” of Cape Mortela.

Typical form. Alt.  $30\frac{1}{2}$ , diam. 31 millim. Abundant everywhere near Menton, up to about 2000 feet.

Measurements below, from Pfeiffer, Mon. i. p. 241:—

Diam. maj. 41, min. 32, alt. 32 millim.

*B. minor*—diam. maj. 28, min. 23, alt. 22 (spec. Azor.)

#### HELIX (POMATIA) APERTA, Born.

This is a small form, to be found here and there round Menton; by no means common.

Alt.  $21\frac{1}{2}$ , diam.  $19\frac{1}{2}$  millim. Submaritime zone, Menton.

Subvar. *ampla*. I found one or two specimens only, near the surface of the “Couche marneuse” of Cape Mortela; like the preceding, it does not appear to exist lower down, in the zone of *H. paretiana*.

Alt.  $29\frac{1}{2}$ , diam. 26 millim.

Below I give measurements of Pfeiffer, in Mon. i. p. 25:—

Alt. 27, diam. maj. 26 millim.

#### HELIX (MACULARIA) VERMICULATA, Müller.

An ordinary form; is plentiful all round Menton up to a certain altitude, beyond which it does not appear to exist. It is also common, near the surface only, in the “Couche marneuse” of Cape Mortela.

Alt. 22, diam.  $29\frac{1}{2}$  millim.

#### Var. GRIMALDIENSIS, nov.

A remarkable dwarf form, apparently constant, as I found some hundred specimens on the hill of Grimaldi, all in the same locality. Spire varying, but usually more produced than in typical form; last whorl more rounded, scarcely subangulate, more convex at base; aperture less produced, with the columellar margin less oblique and more callous; very variable in its coloration, if any thing a trifle smoother, thicker, and more callous.

Type of var. Alt.  $17\frac{1}{2}$ , diam.  $22\frac{1}{2}$  millim; another specimen, alt. 16, diam.  $21\frac{1}{2}$  millim.

I found, near Roquebrune, a single specimen, some feet below the

surface, of a closely allied, even more characteristic form: spire produced, whorls more convex, the last one perfectly rounded, with its base quite convex; aperture as in var. *grimaldiensis*; it appears to have been less smooth.

Alt. 21, diam.  $27\frac{1}{2}$  millim.

Measurements below from Pfeiffer, Mon. i. p. 273:—

Alt. 21, diam. maj. 35, min. 27 millim.

HELIX (CAMPYLEA) MAURELIANA, Bourg. MS. (Note compl. sur des Moll., Mammif. &c., Cav. près de Vence, 1868, p. 5, name only).

I am indebted to Mons. Bourguignat for the following Latin diagnosis:—

"*T. profunde angustaque umbilicata; depressa, subtranslucida, argute striatula, nunc surdo-albida, olim corneo-viridescenti ac zonulis tribus intensoribus (quarum duæ superiores, angustæ; tertior inferior, lata, ad regionem umbilicalem evanescens) circumcincta; spira depressa, parum convexa; apice obtusissimo, sat valido, argutissime granulato; anfractibus 6 regulariter sensimque crescentibus, supra convexis ac sutura profunda separatis; ultimo validiore, compresso-rotundato, prope aperturam leviter coarctato, ac ad insertionem labri vix descendente; apertura parum obliqua, lunata, externe rotundata, infra rectiuscula vel arcuata; peristomate acuto, patulo ac reflexo; labro supero vix reflexo; labro columellari brevissimo, circa regionem umbilicalem dilatato.*

"Alt. 11–12, diam. max. 21–23 millim.

"Caverne Mars, près de Vence, Alpes-Marit." (Cl. J. R. Bourguignat, in litt.)

Var. ROBUSTA, G. Nevill.

Fairly abundant in deposits *A*, *B*, *D*, and *E*, but very difficult to obtain any thing like perfect specimens. The Menton specimens are rather larger and of a more robust variety than the typical Vence form. In deposit *A* a subvar. *minor* was not uncommon, with more compressed whorls, less produced (almost rounded) aperture, and less open umbilicus, the columellar margin a good deal less oblique. A very characteristic feature in Menton specimens of *H. maureliana* are the often very conspicuous "varices," especially noticeable in young specimens, as in *Nanina*, section *Bensonina* (*N. monticola*, &c.); this, of course, is due to a thickening within the peristome, at different periods of growth, only partially absorbed when the animal recommences the growth of its shell. Mons. Bourguignat writes me that its nearest ally is *H. zonata*, Studer, of which he is inclined to consider it as "une forme atavique." It differs materially from all the varieties I know of *H. planospira*.

Var. *robusta*, from deposit *D* (figured). Alt.  $13\frac{1}{3}$ , diam.  $25\frac{1}{2}$  millim.

Subvar. *appressa*, from deposit *B*. Alt.  $12\frac{1}{2}$ , diam.  $23\frac{1}{2}$  millim.

Type in the collection of Mons. Bourguignat; types of var. and subvar. in the Indian Museum, Calcutta; also in the collections of MM. Bourguignat and Coombe Williams.

*HELIX (CAMPYLÆA) RAMORINIANA*, Issel, Conch. Cav. Ligur. occid. 1867, figs. 4-6.

An interesting rediscovery of this well-characterized and remarkable species, as yet only known from the cavern at Verezzi. I found no traces of the species about Menton, except some half dozen specimens in deposit *F*—that is to say, at the entrance of the cave. Probably the species was a strictly cavern form.

I compared the Menton specimens with Prof. Issel's types in the museum at Genoa; they are exactly similar, except that mine are a trifle larger. My largest measures diam. 22, alt.  $11\frac{1}{2}$  millim., others diam.  $19\frac{1}{2}$ , alt. 10. I ought to mention that Prof. Issel's above-quoted figures are not very successful; indeed the species is not recognizable from them.

Indian Museum, Calcutta; also in coll. Mons. Bourguignat.

*HELIX (CAMPYLÆA) CINGULATA*, Studer, var. *BIZONA*, Rossm. Icon. xi. fig. 683, from near Nice.

Mr. Williams found a single specimen at Sainte-Agnès, at a little over 2000 feet. M. Bourguignat informs me it is true *H. cingulata*, and that he found the form abundant in the Col di Tenda.

I can hardly bring myself to believe this form specifically identical with a shell sent me, as *H. cingulata*, var. *anconæ*, Gentiluomo, from Tuscany. The Menton specimen has a moderately raised spire, rather shallow umbilicus, last whorl not compressed, descending abruptly, convex at base; aperture nearly square, columellar margin scarcely oblique; both zones are somewhat obsolete, the lower one can only just be traced behind the outer lip and in front near the aperture. The above agrees exactly with Pfeiffer's measurements and characters of var. *bizona*, which besides is from the immediate neighbourhood.

Alt.  $11\frac{3}{4}$ , diam.  $21\frac{1}{4}$  millim.

Pfeiffer's measurements (Mon. i. p. 356) of var. *bizona* are—diam. maj. 24, min. 21, alt. 12 millims.

Indian Museum, Calcutta.

*HELIX (MACULARIA?) NICIENSIS*, Férussac.

This appears to have been one of the most characteristic mollusks of Menton in old days, as it is now, and to have changed very little during all the intervening period.

Mr. Williams found a few living specimens at Sainte-Agnès, at a little over 2000 feet, a fine bold form of solid texture and rich coloration. Higher up, between 3000 and 4000 feet, to the very summits of the "Berceau" and "Grand Mont," *H. niciensis* abounds. The form here approximates nearer to my subfossil var. *primitiva*; it is of thin texture, very variable as to the more or less

elevated spire; without exception, as far as I could see, imperforate, with large and produced aperture, deflected last whorl, and fairly vivid markings.

Specimen from Sainte-Agnès—alt.  $17\frac{1}{2}$ , diam.  $25\frac{1}{2}$  millim.

From the "Berceau"—alt. 15, diam.  $24\frac{1}{2}$  millim.; and another—alt.  $17\frac{1}{2}$ , diam.  $24\frac{1}{2}$  millim.

#### Subvar. COLORATA.

I did not find this species at all in the "Couche Marneuse" of Cape Mortela (zone of *H. paretiana*), though I have but little doubt it occurs. I found it, however, associated with *H. paretiana* near Monaco, and at another spot in a cutting of the railway, the single specimen from the latter locality being a most remarkable small form, the chestnut maculations being most unusually broad and close together, so much so as to amount to bands; there are three of these slightly interrupted bands on each of the last few whorls; the aperture also is less produced, the apex more prominent, and the whorls more compressed.

Alt. 14, diam.  $19\frac{1}{2}$  millim.

#### Subvar. PRIMITIVA.

Closely allied to the living form still to be found near the summits of the neighbouring Alps; imperforate, of thin texture; spire more or less raised, not nearly so depressed as in the next variety, with prominent apex; whorls moderately convex, the last one abruptly deflected, convex at base; both aperture and last whorl a trifle smaller in proportion than in the living form; the columella very similar, only moderately oblique, forming a slight angle at its termination, slightly twisted, imparting to it a sub tuberculose appearance.

This was one of the commonest (and best-preserved of the large species) in deposits *A*, *B*, *C*, *E*. Curiously enough, the species did not occur at all in deposit *D*; probably this locality was not sufficiently sunny.

I have great doubts whether I have done right in separating this form, even only as a subvariety, from its close ally, living on the neighbouring mountain-tops; probably both had better be classed together as subvar. *primitiva*, characterized by the thin texture &c.

Alt. 16, diam. 22 millim.; another—alt. 17, diam.  $24\frac{1}{2}$  millim.

Types of preceding subvars., Indian Museum, Calcutta; the latter also in coll. MM. Bourguinat, Coombe Williams, and Joly.

#### Var. SPELUNCARUM, nov.

As to the necessity of separating this form there can be no two opinions; it is an exceedingly well and constantly characterized depressed variety, presenting a most distinct "facies." It was abundant in deposit *F*, and, I have reason to believe, was the principal shell found inside the cave by M. Rivière, mixed with mammal-bones &c., judging from specimens in the museum, and from an examination of the earth dug out from these caves. Markedly and in

variably more depressed, of stouter texture than the preceding, less brilliantly coloured, more often distinctly rimate than imperforate; apex acute, but less prominent; whorls distinctly less convex, the last one less expanded, less deflected at the aperture, with the periphery subangulately compressed, and base much less convex; aperture smaller in proportion, outer margin more equally rounded, the columella a good deal more oblique, with a conspicuous absence of the subangulation at its termination, and without the slight twist (or contortion) invariably found both in living specimens and in my subvar. *primitiva*; collumellar callosity less developed.

Alt.  $12\frac{1}{2}$ , diam. 20 millim.

Type var., Indian Museum, Calcutta; also in coll. MM. Bourguignat, Coombe Williams, and Joly.

Measurements from Pfeiffer (Mon. i. p. 284):—Diam. maj. 23, min. 19, alt. 12 millim.

#### HELIX (FRUTICICOLA) CEMENELEA, Risso.

(= *H. galloprovincialis*, Dupuy, 1848, not of Matheron, 842; = *H. cantiana* auct., nec Montagu.)

I cannot agree with Dr. Kobel and the Marquise Paulucci, who, in her excellent and most useful catalogue, unites this and the form called *H. anconæ* by Issel as var. of *H. cantiana*. I consider them quite distinct. At Menton the latter is found from the neighbourhood of the sea up to an altitude of at least 1500 feet; at 2500 feet to 4000 *H. cemelelea* takes its place, and, though varying a great deal, always preserves its distinctive "facies"! I have just been examining living typical English *H. cantiana*, Mont., and find both shell and animal quite different! I have identified both this and the following, on the strength of M. Bourguignat's information. I had previously separated them as quite distinct, taking this to be *H. rubella*, Risso, and the next to be *H. cemelelea*.

Alt.  $11\frac{3}{4}$ , diam. 18 millim. "Berceau," at 3000 feet.

Alt. 10, diam.  $14\frac{1}{2}$  millim. "Grand Mont."

#### HELIX (FRUTICICOLA) ANCONÆ, Issel, Append. Moll. Pisa, 1872.

A species differing still more widely from *H. cantiana*, Mont.; to me, nearer *H. carthusiana*, Müller. It appears to be a common littoral form in Liguria; I found it at Monaco, Menton, Alassio, &c. I cannot consider it identical with the preceding; even if it were to prove specifically so, it must still be regarded as a very distinct and constant variety. The animal is of a light and bright carnation-orange colour, with small and indistinct furrows, tentacles of a dull vinous shade, sole of foot yellow; seen through the shell the animal has a deep vinous appearance, mottled with yellow; axis of spire less central; whorls less elevated, more rapidly increasing, less convex; substance a good deal thicker, peristome much more coloured; umbilicus considerably less open; aperture more produced; columella more oblique &c.

Alt.  $11\frac{1}{2}$ , diam.  $16\frac{1}{2}$  millim.; another—alt. 9, diam.  $15\frac{1}{4}$  millim.



## Subvar. MINOR.

A very small form from Roquebrune: can this be the *H. delacourti*, Mabille, of Bourg., which he informs me (*in litt.*) that I sent him from Menton? He inserts the species between *H. cemenlea* and *H. anconæ*.

Alt.  $7\frac{3}{4}$ , diam.  $11\frac{3}{4}$  millim.

## HELIX (FRUTICICOLA) CILIATA, Studer.

I only found two specimens of this interesting species in deposit B; both agree in differing from recent Swiss specimens (received from Madame Vimart), having the aperture more laterally produced (that is, broader in proportion to its height), the last whorl more dilated, the base less convex, and the periphery slightly more distinctly keeled. Judging from M. Bourguignat's description of his *H. guevarriana*, from the neighbouring Col di Tenda, these Swiss specimens answer exactly to his description of his new species, and my Menton subfossil ones to that of his *H. ciliata*.

Alt. 5, diam. 9 millim.

## HELIX (FRUTICICOLA) CINCTELLA, Drap.

A single perfect specimen and some fragments, from deposit B. Both this and the preceding are recorded as living in the department by Risso.

Alt. 8, diam. 12 millim.

HELIX (FRUTICICOLA) GELIDA (?) Bourg. (Rev. et Mag. Zool. 1877, Mountain behind Briançonnet, Alpes-Marit.; alt. 7, diam. 10 millim. Also subfossil from "Cap Vieille," near Roquebrune.)

M. Bourguignat kindly identified as this species three specimens from the "Berceau" (3500 feet); they do not, however, answer well to his description, being more narrowly umbilicate than *H. moutoni*, *telonensis*, or *diæga*! I should have classed them as a sub-variety of *H. telonensis*, Mittré.

Alt. 6, diam. 10 millim.

HELIX (FRUTICICOLA) MOUTONI, Mittré, MS. (Rev. Mag. Zool. 1877, "Ascros," Alpes-Marit., &c.; alt. 6, diam. 10 millim., *fide* Bourg.).

I am indebted to M. Bourguignat for his identification as above of this form, which appears to be not rare on the "Grand Mont" and "Berceau," at 3000 to 4000 feet.

Alt.  $7\frac{3}{4}$ , diam.  $11\frac{1}{2}$  millim. "Berceau" *H. moutoni*, *fide* cl. Bourg.

Alt.  $7\frac{3}{4}$ , diam.  $12\frac{1}{2}$  millim. "Grand Mont."

## Var. SUBFOSSILIS, nov.

A single subfossil specimen, from deposit B, differing from every other specimen of this group that I know by its exceedingly narrow perforation; the collumella is more oblique than in the preceding.

It answers well to the description of *H. crimoda* and *H. concreta*, Bourg. *loc. cit.*, of which it may be a large variety.

Alt. 7, diam. 11 millim.

Type var., Indian Museum, Calcutta.

*HELIX* (*FRUTICICOLA*) *DIEGA*, Bourg. (Rev. et Mag. Zool. 1877, Clus de St. Auban; alt. 6, diam. 11. Var. *major*, Briançonnet, Alpes-Marit.; alt.  $6\frac{1}{2}$ , diam.  $11\frac{1}{2}$  millim.).

I am indebted to M. Bourguignat for two typical specimens from the Col di Tenda; Mr. Williams found a similar, though larger, form on the "Grand Mont." I consider the species quite distinct from *H. moutoni*; but it is very close to *H. telonensis*, from which the white band at the periphery would not be sufficient ground alone for specific separation; the aperture, however, seems to me markedly larger in proportion, with less broadly reflected peristome.

Alt.  $7\frac{1}{8}$ , diam. 12 millim. "Grand Mont."

Alt. 6, diam. 10 millim. "Clus de St. Auban," ex coll. cl. Bourguignat.

*HELIX* (*FRUTICICOLA*) *TELONENSIS*, Mittré (*vide* Bourg., Rev. Mag. Zool. 1877; alt. 5 to  $5\frac{1}{2}$ , diam. 10 millim.).

Scarcely, I think, specifically distinct from the preceding. M. Bourguignat identified as this species several specimens (in poor condition) from the "Grand Mont," at 4000 feet; two subfossil specimens from deposit *B* are even nearer the typical Toulon form.

Alt. 6, diam.  $10\frac{1}{2}$  millim. Subfossil specimen from deposit *B*.

Alt.  $5\frac{1}{2}$ , diam.  $9\frac{1}{4}$  millim. Specimen from Toulon.

Alt.  $6\frac{1}{8}$ , diam.  $10\frac{1}{8}$  millim. Specimen from "Grand Mont."

Var. *CRASSILABRIS*, nov.

A single specimen, in perfect condition, from the "Grand Mont," quite distinct from all the forms mentioned by Bourguignat *loc. cit.*; chestnut-brown, with well-defined, broad, white belt at periphery; spire rather depressed, with six scarcely convex, lightly striate whorls; compressedly angulate at periphery, base evenly rounded (but not convexly swollen) round the unusually open umbilicus; aperture very small comparatively; peristome very broadly reflected; columella very oblique. Resembles *H. diega*, with aperture of *H. telonensis*.

Alt.  $6\frac{1}{8}$ , diam. 11 millim.

Type var., Indian Museum, Calcutta.

*HELIX* (*COCHLICELLA*) *ACUTA*, Müller.

Rather scarce near Menton, close to the sea.

*HELIX* (*COCHLICELLA*) *BARBARA*, Linnæus.

*Helix ventrosus*, Fér. Prod., = *H. ventricosa*, Drap.

Like the preceding, by no means common.

*HELIX* (*EUPARYPHA*) *PISANA*, Müller.

Rare, near the sea only.

### HELIX (XEROPHILA) CESPITUM, Drap.

This species, also near Menton, appears to differ widely, and, at the same time, constantly, according to the altitude at which it lives; it is interesting to notice, in the "Couche marneuse" at Cape Mortela, how an allied species, with narrow umbilicus, either *Helix ferneri* or a closely connected form, abounded at a certain depth, associated with *H. paretiana*, how this species suddenly ceases at a certain distance from the surface, its place being taken by the widely umbilicate *H. cespitum*.

#### Var. DISMASTHIA, nov.

Spire very little raised, often nearly quite flat, rather solid; whorls seven, scarcely convex; last whorl compressed, scarcely descending, not tumid at base; umbilicus less open than in most forms of *H. cespitum*; aperture rather compressed, slightly produced, columellar margin very oblique; vividly coloured; above coarsely but regularly and closely striate, striæ subobsolete at base.

This form is abundant near the sea only, apparently not found at any considerable altitude, where its place is markedly taken by the next variety; I found it also at Alasio, near Genoa. A curiously coloured form, common at both places, was of a nearly uniform dark brown above, with a bright yellow belt at the periphery.

Alt.  $12\frac{1}{2}$ , diam.  $21\frac{1}{2}$  millim.; apert. alt.  $9\frac{1}{2}$ , lat.  $10\frac{3}{4}$  millim.

#### Var. ALTICOLA, nov.

Like the preceding a well-marked, characteristic, and constant variety; the two forms apparently do not, at Menton at least, run into one another; the two almost seem to me specifically separable; some conchologists will doubtless consider them so; the anatomist will have to settle the question. At an altitude of 2000 feet for certain (perhaps sooner), var. *alticola* takes the place of var. *dismasthia* and is found in great abundance up to the very summits of the mountains, over 4000 feet.

Spire moderately raised, almost smooth; the upper whorls sub-obsolete striate, openly and solariformly umbilicate, texture a good deal thinner than in the preceding var.; whorls seven, convex, last whorl globosely rounded, tumid at base; aperture nearly perfectly round, the interior as high as broad, outer margin descending more abruptly, the columellar one markedly less oblique, the peristome less thickened within; coloration, above especially, less vivid.

Alt. 18, diam.  $27\frac{1}{2}$ ; apert. alt.  $13\frac{1}{4}$ , lat. (cum marg.) 14 millim.

For comparison with the two preceding measurements, I give below those of *H. cespitum* and its var. *major* as recorded by Pfeiffer (Mon. i. p. 161).

Diam. maj. 20, alt. 11 millim.

Var. *major*—diam. maj. 25, alt. 14 millim.

Types of the two preceding varieties in Indian Museum, Calcutta.

### HELIX (XEROPHILA) SUBCESPITUM, n. sp.

I found a few subfossil specimens of this undoubtedly distinct

new species, immediately above the spot I call deposit *B*; but in no case could I find a specimen undoubtedly associated with the species of this deposit; it may be that they are of the same age, only that they were not living immediately mixed up with these other mollusks. After a long and tedious investigation I have come (though somewhat doubtfully) to the opposite opinion; I believe they are of a more recent age, and have been buried through some altogether different cause. I purpose giving a full description and figure at some future time, as I wish to compare the species of this group with my Spanish, Algerian, and Corsican specimens, which are not at the moment available.

Alt. 10, diam.  $18\frac{1}{4}$  millim.

Type, Indian Museum, Calcutta.

*HELIX (XEROPHILA) TERVERI* (?), Michaud.

I think there is little doubt this is the species living specimens of which, from Toulon, were described and figured under the above name by M. Rambur (Journ. Conchyl. 1869). It does not exist now at Menton, where varieties of *H. cespitum* have taken its place; I found it, however, subfossil and by no means uncommon near Roquebrune station, near deposits *B* and *D*, and in the lower stratum at Cape Mortela, immediately associated with *H. pare-tiana*.

Alt.  $11\frac{3}{4}$ , diam. 19 millim.

Var. *SUBARENARUM*, nov.

A larger and more globose form, very likely specifically distinct, of which I found a few specimens only, subfossil.

Alt. 14, diam.  $21\frac{1}{2}$  millim.

Both the preceding forms, Indian Museum, Calcutta.

*HELIX (XEROPHILA) SCLERA*, n. sp.

*T. ad H. cespitum et H. Terveri affinis: conico-elevata, peranguste profundeque umbilicata, solida; alba (aut cretacea), zonulis variis circumscripta, apice corneo ac notabiliter acuto; anfract. 7, convexiusculi, sutura perimpressa separati, ultimo majore, rotundato, basi convexo, prope aperturam celeriter descendente ac vix dilatato; apertura haud producta, fere rotundata, margine externo convexo; superne regulariter confertim striata, striis obliquis, subflexuosis et planiusculis.*

Alt.  $13\frac{1}{2}$ , diam. 19 millim.

Another very distinct species of the same group; the least openly umbilicate, with the most subconvexly raised spire and the most prominently acute apex of any I know; the rapidly descending, scarcely dilated and rounded last whorl, as also the more distinct, subflexuous sculpture are also apparently constant characters; it only occurred, subfossil, imbedded in hard and solid rock, in the upper surface of deposit *E*, evidently associated with *Stenogyra decollata*.

Type, Indian Museum, Calcutta.

*HELIX (XEROPHILA) LINEATA*, Olivi (= *H. maritima*, Drap., alt. 8, diam. maj. 11, min.  $9\frac{1}{2}$  millim.).

Exceedingly abundant in the sub-maritime zone near Menton; it also occurred at Alassio. I found many curious varieties and deformities; the commonest forms are uniform brown, or white with a broad brown band, both plentiful in all sizes.

Subvar. *major*. Alt.  $11\frac{1}{2}$ , diam. 15; another—alt.  $10\frac{1}{2}$ , diam.  $13\frac{1}{4}$  millim.

Subvar. *minor*. Alt. 8, diam. 9 (a beautiful and rare form); another—alt.  $6\frac{1}{2}$ , diam. 9 millim.

*HELIX (XEROPHILA) VARIABILIS*, Drap. (alt. 12, diam. maj. 19, min. 17, ex Pfeiffer, Mon. i. p. 157).

I only found this species at Cape Vieille, between Roquebrune and Monaco, where it appeared to be rather localized.

*HELIX (XEROPHILA) PSEUDENHALIA*, Bourg. (Mal. Château d'If, pl. i. figs. 17–21, 1860; alt. 8–9, diam. 10–11 millim.).

M. Bourguignat regards this species as not belonging to the group of *H. maritima*. I confess it seems to me scarcely separable, even specifically. Menton specimens are subkeeled at the periphery.

Alt.  $7\frac{3}{4}$ , diam.  $10\frac{3}{4}$  millim.

*HELIX (XEROPHILA) NEGLECTA*, Drap. (alt. 7, diam. maj. 14, min. 12 millim., ex Pfeiffer, Mon. i. p. 164).

Very local at Menton, confined, as far as I know, to the neighbourhood of Roquebrune station.

Alt.  $7\frac{1}{2}$ , diam.  $12\frac{1}{4}$  millim.

*HELIX (XEROPHILA) PALADILHI*, Bourg. (Moll. Nouv. &c. 1866, pl. xxx. figs. 1–5, Montpellier; alt. 4, diam. 7 millim.).

I include this species, as Mr. Bourguignat informs me I sent him a single specimen mixed up with *H. candidula* from Menton. Mr. Williams found a single specimen of a closely allied species at over 3000 feet on the "Grand Mont," which I am unable to identify; it can scarcely be an extreme var. of this species. At Alassio, however, I found two specimens of a very distinct little form, which agree exactly with the original figure of this species.

Alt.  $4\frac{1}{6}$ , diam. 7 millim. Specimen from Alassio.

Alt.  $5\frac{1}{4}$ , diam.  $8\frac{1}{4}$  millim. From the "Grand Mont;" specific identification very doubtful.

*HELIX (XEROPHILA) TERRESTRIS*, Chemnitz (alt.  $6\frac{1}{2}$ , diam. maj. 10, min. 9, ex Pfeiffer, Mon. i. p. 179).

Extremely abundant at Menton, where I found many curious forms, some much distorted. M. Bourguignat writes me that I sent him one very curious abnormal specimen, "having the ordinary

upper whorls and then, owing to some injury, the lower whorl of a *H. pyramidata*."

Alt.  $5\frac{3}{4}$ , diam.  $11\frac{3}{4}$ ; another—alt. 7, diam. 9 millim.

*HELIX (XEROPHILA) PYRAMIDATA*, Drap. (alt.  $7\frac{1}{2}$ , diam. maj. 11, min. 10 millim., ex Pfeiffer, Mon. i. p. 160).

Also common near Menton. I found neither this, the next, nor the preceding species at Alassio. One specimen which I found is almost discoidal.

Subvar. *major*. Alt. 9, diam. 12 millim.

Subvar. *minor*. Alt.  $5\frac{1}{4}$ , diam.  $7\frac{1}{4}$  millim.

*HELIX (XEROPHILA) UNIFASCIATA*, Poiret (Prodr. 1801, = *H. candidula*, Studer, 1820; alt. 5, diam. 8–9 millim., ex Pfeiffer, Mon. i. p. 168).

Very common, varying much in size. A rare subvariety occurred on Grimaldi Hill, dark brown above and the outer half of the base, with a narrow, well-defined, light-yellow belt at the periphery, just traceable along the suture, the central portion of the base straw-colour, last whorl more compressedly subangulate.

Subvar. *major*. Alt. 6, diam. 10 millim.

Subvar. *minor*. Alt.  $3\frac{1}{2}$ , diam.  $5\frac{3}{4}$  millim.

Subvar. *luteofasciata*. Alt. 4, diam.  $6\frac{1}{2}$  millim.

*HELIX (XEROPHILA) CONSPURCATA*, Drap. (alt.  $3\frac{1}{3}$ , diam. maj. 6, min. 5 millim., ex Pfeiffer, Mon. i. p. 171).

Very common all along this part of the Riviera, as far (at least) as Alassio.

Alt. 4, diam. (vix)  $6\frac{1}{2}$  millim.

Var. *ILLUVINOSA*, nov.

(An potius *H. illuviosa*, n. sp.?)

An apparently constant form, differing conspicuously in the character of the epidermis and slightly in those of the shell itself. The form not being known to M. Bourguignat, I should not have hesitated to describe it as new, but that I found so few specimens, only two or three mature and a few young ones; they all came from a damp shady ravine halfway up the hill, immediately behind the Hotel des Anglais.

*BULIMINUS (CHONDRULA) QUADRIDENTS*, Müller.

Var. *PROLIXA*, Pini (Nuove spec. &c. Moll. 1879).

I am indebted to M. Bourguignat for the information that this very common Menton shell is the var. *prolixa* of Pini; it is very abundant and variable from the sea-level up to some 2000 feet; it is also found near the summits of the "Berceau" &c., but is there a rare shell; it did not occur at all subfossil. All the numerous varieties have the aperture distinctly quadridentate, there being amongst them no apparent transition to the next species, which we did not find at all recent.

Long.  $11\frac{1}{4}$ , diam.  $4\frac{1}{4}$  millim. An elongate, more or less compressed form, not uncommon in the submarine zone.

Long. 13, diam.  $4\frac{1}{2}$  millim. The ordinary Menton form.

Long.  $9\frac{1}{2}$ , diam.  $3\frac{3}{4}$  millim. A small and rather convex form, rather scarce here.

#### BULIMINUS (CHONDRULA) NISO, Risso.

Apparently very scarce; I found five or six subfossil specimens only in deposit *B*; they agree in being a small, more or less sub-convex form, with the columellar dentition quite different from that of the preceding.

Long. 10, diam.  $3\frac{1}{2}$  millim.

Indian Museum, Calcutta.

#### PUPA (PUPILLA) MUSCORUM, Linnæus.

A few specimens from deposit *F* only, all of them possessing a parietal tooth. The species did not occur recent at Menton; but I found very similar specimens to the above subfossil ones at Alassio.

Long.  $3\frac{1}{2}$  millim.

#### PUPA (PUPILLA) UMBILICATA, Drap.

We did not ourselves find this species at Menton; but I saw specimens in the small museum, found just outside the town. I found a curious variety of it at Alassio.

#### PUPA (VERTIGO) MINUTISSIMA, Hartm.

I found only two broken specimens in deposit *B*; the whorls were very convex and tumid, no parietal fold (or tooth); I think, only 5 whorls.

Var. (? sp. distinct.).

Three broken specimens from deposit *B*, differing conspicuously from the preceding; six whorls, much less convex and tumid, giving the form an attenuate appearance; the aperture has a strongly developed parietal fold; the striation seems more oblique.

Both of the above (subfossil forms) in Indian Mus. Calcutta.

#### PUPA? (TORQUILLA?) PSAROLENA, Bourg.

Originally described as *Bulimus*, sp. Rossmässler, Ic. vol. iii. 1854, fig. 929, who figures the species as *Bulimus cinereus*, Mortillet, Cat. Coq. Nice, 1851, between the Col di Tenda and Nice (that is, just behind Menton), notices its affinity to species of *Torquilla*, and hesitates in which genus it should be classed. When I found my single very perfect specimen in deposit *B*, I felt no doubt of its being an edentulate species of *Torquilla*, and have not altered my opinion since M. Bourguignat gave me some typical living specimens. My subfossil specimen differs not a little from the latter, resembling still more strongly species of *Torquilla*; whorls distinctly 7, more elongately, regularly produced, the last one not so convexly tumid; in proportion the aperture a little shorter and less

everted, with less oblique columella; it is, however, too close to be separated, even as a variety.

Unique (subfossil) specimen in Indian Museum, Calcutta.

PUPA (TORQUILLA) QUINQUEDENTATA, Born.

Living specimens are most abundant all along the Genoese Riviera, at Monaco, Menton, Alassio, &c. At Menton it is found from the sea up to 2500 feet; after that it becomes much rarer, but exists up to nearly 4000 feet. There is but little difference between the sub-maritime form and that from the higher regions; the latter are generally somewhat smaller.

Long.  $14\frac{1}{3}$ , diam. 4 millim. A fine form from Roquebrune station.

Long.  $14\frac{1}{4}$ , diam.  $3\frac{1}{6}$  millim. A rare and remarkably attenuate var., of 11 whorls, from St. Agnès (2500 feet).

Long.  $9\frac{1}{2}$ , diam.  $3\frac{1}{3}$  millim. A common dwarf form from the same spot.

Long.  $13\frac{1}{4}$ , diam.  $3\frac{3}{4}$  millim. A common cylindrical form from the "Berceau."

Var. PRÆHISTORICA, nov.

The commonest subfossil shell in all the deposits except *F*; though varying in countless ways, it always preserves a distinct "facies" from that of the preceding living form; it can invariably be distinguished by the much stronger and more regular striation, not so oblique, so flexuous, or so inclined to be subobsolete; the aperture is also invariably smaller and more contracted, less everted as a rule, with both margins straight and parallel, instead of more or less rounded; the folds appear scarcely to differ at all.

Long. 14, diam. 4 millim. Type of the var. from deposit *B*.

Var. SPELUNCARUM, nov.

A more distinct and characteristic variety than the preceding, which I only found in deposit *F*, where it was abundant, and in the interior of the cave itself (as I have already mentioned). A very short, convexly swollen, tumid form, of only 9 instead of 10 whorls, the last being proportionally much broader; striation more like that of the typical form than of the preceding variety; the short, quadrangular, unusually everted aperture, with remarkably thickened and reflected peristome, seems to be its most characteristic feature, the margins being more convexly rounded and united by a distinct (instead of subobsolete) callosity; I can see no difference in the folds (or teeth).

Long.  $10\frac{1}{2}$ , diam.  $3\frac{1}{2}$  millim. From deposit *F*.

Types of all the preceding in Indian Museum, Calcutta.

PUPA (TORQUILLA) MULTIDENTATA, Olivi.

= *P. variabilis*, Drap.

Though more localized than the preceding, a very common Menton mollusk, varying enormously in the number and shape of the whorls



&c., with a marked tendency (here at least) to produce abnormal and remarkable forms: it also ranges from the sea to a considerable altitude, though I do not think Mr. Williams found it above 2800 feet. I found what I consider the typical form, small and moderately convex, here and there near the sea, rather scarce, not in company with the following variety; we also procured somewhat similar specimens from St. Agnès (2500 feet). It did not occur at Alassio.

Long.  $10\frac{1}{2}$ , diam.  $3\frac{1}{4}$  millim. A constant form, Menton (11 whorls).

Long.  $13\frac{1}{4}$ , diam.  $3\frac{3}{4}$  millim. From St. Agnès (12 whorls).

Var. *POLITA*, Risso.

The finest and most remarkably turriculately produced specimens of this variety which M. Bourguignat had ever seen were some I found on the Hill of Grimaldi, where, though localized, it abounded; I found a similar form in the upper stratum of Cape Mortela.

Long. 19, diam.  $4\frac{1}{2}$  millim. An extreme turriculate form, of 15 whorls, from Grimaldi.

Long. 15, diam. 4 millim. An ordinary form, village of Roquebrune (1500 feet).

PUPA (*TORQUILLA*) *OBLIQUA*, n. sp. (Plate XIII. fig. 4.)

*T. ad P. multidentatam affinis, sed forma minor, compressior, magis cylindrica et turriformis; anfr. 11, fere æquales, sutura magis impressa separati; apertura percontracta, quadrangularis, marginibus subrectis, parallelis ac callositate pervalida junctis; margine columellari inferne distincte angulato (in P. multidentata subrotundato); plica parietalis minus obliqua et prominens, plica columellares magis profundæ, plica palatalis principalis conspicua et notabilis, recte ascendens, haud arcuatim incurvata.*

A rather rare species, from deposits *B* and *F* only; M. Bourguignat informs me he possesses numerous recent specimens from the "Plateau glacé de Méaille, Dépt. Basses-Alpes." I had hoped he would have honoured me with a Latin diagnosis, as in two other instances, in which case I should gladly have attached his name to this species; I do not think it right to do so without such diagnosis, for fear of introducing doubt as to what is really the type of the species. I should have ranked this subfossil form as a remarkable dwarf variety of *P. multidentata*, but for the constant and characteristic difference in the prominent palatal fold, which is always more or less semicircularly and markedly curved or rounded in all the forms I know of *P. multidentata*; in my new species this fold ascends the aperture without any deflection or curve whatever; the parietal fold is also distinctly straighter and less prominently produced; the columellar margin not being in the least convex, as well as distinctly angulate at base, seems also a constant character. The present form is nearer the wonderfully produced and turriculate var. *polita* of Risso than typical *P. multidentata*.

Long. 10, diam. 3 millim. Type from deposit *F*.

Long.  $9\frac{1}{2}$ , diam.  $3\frac{1}{10}$  millim. Specimen from deposit *B*.

Type, Indian Museum, Calcutta ; also in coll. MM. Bourguignat and Williams.

PUPA (TORQUILLA) SECALE, Drap.

Recent specimens were abundant near the summit of the "Grand Mont," at 4000 feet.

Long.  $6\frac{3}{4}$ , diam.  $2\frac{3}{4}$  millim.

In coll. Indian Museum, J. R. Bourguignat, and Coombe Williams.

PUPA (TORQUILLA) AVENACEA, Brug.

Living abundantly, with the preceding, at 4000 feet ; we also found it, but rather scarce, in deposits *B*, *C*, and *F*.

Long. 7, diam.  $2\frac{1}{2}$  millim. From the "Grand Mont."

Long.  $7\frac{3}{4}$ , diam.  $2\frac{1}{2}$  ; another, long. 5, diam. 2 millim. Deposit *B*.

PUPA (TORQUILLA?) GRANA, Drap.

A very common form everywhere in the Submaritime zone ; it did not occur subfossil or at higher elevations. I much doubt if this species is a true *Torquilla* ; I believe the animal will prove to be of a different type ?

Var.

A rather scarce form, living in shady and damp localities ; it may possibly be a distinct species, perhaps the *P. micheli*, with which I am not acquainted.

PUPA (ORCULA) DOLIOLUM, Brug.

Rare, at a single spot in deposit *B* : this is the first record of this species in the Alpes-Maritimes, it is not mentioned in Risso's work.

In coll. Indian Museum, Calcutta, J. R. Bourguignat, and Coombe Williams.

PUPA (SPHYRADIUM) BOURGUIGNATIANA, n. sp. (Plate XIII. fig. 5.) Specimen figured has since been accidentally broken.

*T. aperte perforata, cylindrica, regulariter turrisformis, apice obtuso, levigata, nitida ; anfract. 10, vix convexiusculi, fere aequales, sutura impressa separati, ultimo brevi, inferne paululum compresso ; sub lente obsolete striatula, striis paululum obliquis, regularibus ; apertura angusta, triangulariformis, superne dilatata, inferne attenuate compressa, plicis 4 minutis ; plica parietali validissima, paululum obliqua, plica columellari prominente, subrecte transversa, 2 palatalibus haud conspicuis ; peristom. expansum, incrassatum, marginibus callo crasso junctis, margine dextro supra medium dente valido munito, margine columellari supra medium abrupte deflexo.*

\* Long.  $5\frac{1}{2}$ , diam. (vix)  $1\frac{1}{2}$  millim.

Subvar. OBESA, nov.

*Anfract.  $8\frac{1}{2}$ , paululum magis convexiusculi et magis celeriter cre-*

*scentes, ultimo longiore, basi rix compresso; apertura amplior, inferne minus contracta, margine columellari rectiore.*

Long. 5, diam.  $1\frac{5}{8}$  millim.

Type, Indian Museum, Calcutta; also in coll. MM. Bourguignat, Coombe Williams, P. Joly, P. Fagot, and Colonel Godwin-Austen.

This was exceedingly abundant in deposits *A, B, C*; I found a single specimen in deposit *F*, of a short thickset variety (var. *tumida*), probably enough a distinct species. Typical *Pupa biplicata*, Mich., and *P. ressmanni*, Villa, are the nearest forms I know to *P. bourguignatiana*; from both the present species can be told at once by the above-described characters of the aperture. A specimen from Tuscany, which I obtained from Madame Vimont at Paris, labelled *P. biplicata*, is a totally distinct species from the Menton one; it is the *P. toscanae* of Bourg.

Var. *PLAGIOSTOMA*, nov. (Plate XIII. fig. 6.)

(An potius *Pupa plagiostoma*, n. sp.?)

This is a well-marked and very distinct form, distinguishable at a glance by the characters of the aperture, which appear to be constant; it was by no means rare in deposits *B* and *C*.

Spire slightly convex, less gradually tapering (or turreted); whorls  $8\frac{1}{2}$ , the first  $3\frac{1}{2}$ , increasing rapidly, the others of almost equal breadth, the last one longer in proportion, more compressed at its base, so much so that it has a subcarinate appearance round the umbilicus; striation a little more distinct and more oblique; aperture quite differently shaped, not triangular, but more compressed, narrowly oblong, as broad at its base as above; both columellar and parietal folds more twisted, the former less straightly transverse; the two palatal ones, seen through from the back, appear more callous and to run into one another, in the type form they appear to run more or less parallel; the peristome even more callously thickened, with its margins joined by a more developed callosity; the columellar margin has a very slight bend at its commencement, otherwise it is quite straightly oblique, without the characteristic deflection of *P. bourguignatiana*; the callous tubercular tooth on the outer margin equally prominently and robustly developed; this tooth appears to be peculiar in the group to the Menton species, in which it exists in every specimen and in all the varieties, the other species merely possessing a slight thickening in its place, as far as I know.

Long.  $4\frac{1}{2}$ , diam.  $1\frac{1}{4}$  millim.

Subvar. *ANGUSTA*, nov.

This is a by no means rare form, which has decided me on not specifically separating the preceding; it has a similar aperture, as also a coarser striation, but possesses 10 whorls, the first eight of which are even more cylindrical than in the type form, and more compressed, the last two being in proportion stouter and more convex, imparting to the spire a remarkable emaciated appearance.

Types of the variety and subvariety are in the Indian Museum, Calcutta; also in collections of MM. Bourguignat and Coombe Williams.

Var. *PRÆCLARA*, nov. (Plate XIII. fig. 7.)(An potius *P. præclara*, n. sp.?)

This I for some time considered a distinct species; at any rate it is a well-marked constant variety. It was not rare, in deposit *B* only, and often in such perfect preservation that it looked as if the animal had only just been extracted.

Spire slightly convex, much like that of var. *plagiostoma*, but more pupiform—that is, more tumidly swollen, not so attenuately contracted; whorls 8 to 9, the last two proportionally more swollen and convex, the last not compressed at its base (in this unlike all the preceding); very translucent, so much that the columella can be traced sometimes nearly to the apex, smooth, shining, no trace of the oblique sculpture characteristic of the preceding; the aperture is not unlike that of var. *plagiostoma*, though less contracted, equally oblong, as broad below as above—that is, with the margins parallel; the parietal fold considerably less vertical than in the type form; the columellar one similarly straightly transverse; the palatal ones, as seen through the back of the last whorl, seem to me much the same; the outer margin is less straight than in any of the preceding forms—that is to say, is more pinched-in at the callous tooth, and is consequently more arcuate above and below; the columellar one considerably less oblique, above scarcely twisted, at base more gradually rounded.

Long.  $4\frac{1}{2}$ , diam. (vix)  $1\frac{1}{2}$  millim.

Type var., Indian Museum, Calcutta; also in coll. Bourguignat and Coombe Williams.

Var. *GRIMALDIENSIS*, nov.(An potius *P. grimaldiensis*, sp. nov.?)

This form, I believe, will eventually prove to be distinct from its allies found on the other side of the headland, as is the case with species of *Clausilia* and *Pomatias*; as, however, I only found, in deposit *D*, a single specimen (the preceding forms not being found there at all), I do not feel justified, at present, in describing it as a distinct species.

A short, tumid, pupiform variety, with only 7 whorls, more convex and increasing more rapidly than in any of the preceding, the last one perfectly rounded at base; the aperture much shorter and less contracted, with much less conspicuous folds, which are further within; the columellar margin more broadly reflected, but less callous, without any twist or deflection whatever, scarcely oblique, almost rounded at base; outer margin with its well-developed tooth, as in the type form.

Long. 4, diam.  $1\frac{5}{8}$  millim.

Unique type var., Indian Museum, Calcutta.

## PUPA (SPHYRADIUM) JOLYANA, n. sp. (Plate XIII. fig. 8.)

*Testa profunde et late umbilicata, regulariter cylindrico-ovata, obtusa, sericina, cornea; confertim plus minusve oblique costulata,*

*costulis haud acutis, subplaniusculis; anfract. 8, regulares, vix convexiusculi, ultimo majore, basi compresso, circa regionem umbilici acute carinato; apertura recta, angustissima, quadriplicata; plica parietali forti, conspicua, contorta, vix obliqua, plica columellari profunda, valida, transversa, plicis palatalibus remotis, haud conspicuis; peristom. album, continuum, solutum, perlato ac crasse reflexum, margine superiore valde intorto, cum margine externo angulum acutissimum formante; margine externo fere recto, supra medium dente pervalido munito, margine columellari recto.*

A very rare and curious form, with wonderfully contracted aperture, of which I could only find four specimens in deposit *B*. I have much pleasure in naming the species after my friend M. P. Joly, of Algiers. The only other known species of this section of *Pupa* (*Sphyradium*) is *P. ferraria*, Porro, a shell which, however, differs totally in its more obtusely conical spire, swollen above; in the Menton species the ovately cylindrical whorls increase regularly, the last one being the broadest; the umbilicus is deeper, and the carination round it more acute; the sculpture, instead of being subregularly oblique throughout, is decidedly less oblique (nearly straight) on the last whorl than on the preceding ones, flexuous, and a trifle more crowded; the aperture is markedly narrower, more everted, and more detached, with the peristome more thickly reflected and its upper margin peculiarly twisted, forming a very acute angle with the outer margin, which is straighter and provided with a much stronger tooth, reaching the centre of the aperture; both parietal and columellar folds more developed, the former more upright, more twisted, the latter buried so far back as to be seen with difficulty.

Long. 4, diam.  $1\frac{1}{2}$  millim.

Type, Indian Museum, Calcutta; also in collection of M. Bourguignat.

*PUPA (SPHYRADIUM) AUSTENIANA*, n. sp. (Plate XIII. fig. 9.)

*Testa aperte, minime profunde, et late umbilicata, conico-ovata, obtusa, fulvo-cornea; eleganter oblique costulata, costulis filiformibus, acutis, perdistinctis, subdistantibus; apex obtusa, laevigata, cornea; anfr. 8, prioribus 4 regulariter crescentibus, convexiusculis, 5<sup>to</sup>, 6<sup>to</sup> et 7<sup>mo</sup> regularibus, perconvexis, turgidis, ultimo perirregulari, multum minore ac minus convexo, in medio linea impressa striato, infra subito minore, valde ascendente; apertura ascendens, perversa, triangularis, basi rotundata, marginibus callo forte junctis; margine externo late reflexo, supra medium valide impresso, intus paululum incrassato, margine columellari simplici, reflexo ac perobliquo.*

This very curious form, named after my friend Colonel Godwin-Austen, belongs to the section *Pagodina* of *Stabile* (Moll. Piémont, p. 100, 1864, type *P. pagodula*, Desmoulins); it was by no means rare, though evidently very local, in deposits *A* and *B* only. The umbilicus is broadly and widely open, but is at the same time very shallow; the two obtuse apical whorls are smooth; the next two

are moderately convex, short, regular, increase rapidly in breadth, the upper one closely costulated, the ribs scarcely oblique; the lower one has these ribs more distant, less crowded and more acutely raised; the next two, of about equal height and breadth, also increase rapidly in breadth, are very convex, the ribs become still a little more acute, more oblique and less crowded; the antepenultimate has similar ribbing, is much the same in size, only a trifle more tumidly convex, it has the peculiar character that whilst on the side of the aperture it only just equals the preceding one in width, on the other side it markedly surpasses it: the last becomes abruptly much narrower above, about equal in width to the fourth whorl; on its centre it is girt with an impressed line, dividing it into two nearly equal portions, the lower of which becomes abruptly narrower and more compressed, and is brought round (or ascends) in such a manner as to peculiarly evert the aperture, and to bring the latter's outer margin right up to the suture, reminding one of the genera *Boysia*, *Scopelophila*, &c.; looking at it from behind the aperture, it ascends so much that, at its termination, it completely hides the antepenultimate whorl. The aperture is much everted, triangular, somewhat contracted by the strong inflection of the outer margin above the middle, caused by the impressed dividing groove of the last whorl.

Long.  $3\frac{1}{6}$ , diam. 2 millim.

Type, Indian Museum, Calcutta; also in coll. MM. Bourguignat, Williams, Fagot, Joly, and Godwin-Austen.

*CLAUSILIA (DELIMA) PUNCTATA*, Michaud.

A rather uncommon and almost invariably broken subfossil form from deposits *A*, *B*, *C*, *D*.

M. Bourguignat found it living in the Col di Tenda.

*CLAUSILIA (DELIMA) VIRIATA*, Bourg. (Hist. Claus. France, 1877, from the Col di Tenda.)

Though almost exactly of the same proportions as the preceding, a totally distinct species, it is quite impossible to confuse the two. This form occurred subfossil, with the preceding, in deposits *A*, *B*, and *C*; they are still to be found living together in the Col di Tenda.

*CLAUSILIA (PAPILLIFERA) SOLIDA*, Drap.

An abundant species from the immediate proximity of the sea up to some 2000 ft.; at the higher elevations on the "Grand Mont," &c. *Cl. solida* does not exist, indeed Mr. Williams could not find there any representative of the genus, although he searched specially for them. The numerous varieties of this form are some of them very interesting; and the whole group requires special study. I think there can be no doubt M. Bourguignat was right in specifically separating one or two of them. Unfortunately it is quite impossible to identify these closely allied forms without first-rate figures. I noticed that the variety living near the sea had a much darker animal than the form I found high up at the village of Roquebrune.

CLAUSILIA (IPHIGENIA?) BIZARELLINA, Bourg. Hist. Clausil. France, 1877.

I am indebted to M. Bourguignat for the above identification. Specimens of this group abounded in countless curious varieties (? species) in all the deposits *A, B, C, D, E*, and *F*. We did not find any living forms of this subgenus ourselves; but numerous species have been described from the higher elevations in the neighbourhood by Risso and Bourguignat.

CLAUSILIA (IPHIGENIA?), sp.

A certainly distinct form from the preceding, and which I only found in deposit *D*. As I have already said, it is hopeless to attempt to identify these species without figures. There can be little doubt this is one of the many new species of this group described by M. Bourguignat, *loc. cit.*, from the department.

CLAUSILIA (subgenus?) PAULUCCIANA, n. sp. (Plate XIV. fig. 1.)

*Testa parva, rimata, fusiformis, tenuiuscula, cornea, haud nitens, regulariter ac eleganter costulata, costulis distantibus, subrectis; apex obtusiusculus, turgidus et quasi mamillatus; anfractus 10, supremi 3 convexi, lævigati, tumidi et mamillati, 3 sequentes contracti, plus minusve convexi, sensim crescentes, 4 ultimi subtumidi, convexi, fere æquales, ultimus subglobulosus, oblique rugoso-costulatus, basi acute ac distanter cristatus; apertura subpyriformis, haud eversa, lamella parietali superiore subrecta, plica spirali inconspicua; lamella parietalis inferior valde ascendens, remota, postice subbifurcata; plica subcolumellaris immersa, inconspicua; plica palatalis unica, supera, sat conspicua; perist. sensim solutum, continuum, expansiusculum ac reflexiusculum.*

Long.  $8\frac{1}{2}$ –9, diam. 2; apert. long.  $1\frac{1}{2}$  millim.

This charming little species appears to have been very rare. However we managed to procure about thirty specimens after much searching. It only occurs in deposits *B* and *C*. It is one of the most distinct and curious of all the Western-European forms. It varies a trifle in the greater or less convexity of the whorls; otherwise it appears to be wonderfully constant, especially as regards the three peculiar apical whorls, the general sculpture, and the aperture. The apical whorl is small and subobtuse, the next two swollen, tumid, and submamillate, all three being perfectly smooth; the next two are smaller (more contracted), regular, scarcely convex, and of almost equal size; the other five whorls are more or less rapidly swollen, the last three being of approximately equal height. The last whorl is more or less subglobose (varying somewhat); the sculpture is fairly constant, the last seven whorls being beautifully and distinctly costellated with nearly perpendicular, distant, subacute ribs; these on the last whorl, however, become more oblique, and near the peristome are very acute ("cristate" as it were). The aperture is detached from the last whorl in a very characteristic manner, though not everted; it becomes in old specimens subcallose.

Type, Indian Museum, Calcutta; also in coll. J. R. Bourguignat, Coombe Williams, P. Joly, T. Fagot, and Colonel Godwin-Austen.

*STENOGYRA (RUMINA) DECOLLATA*, Linnæus.

Abundant everywhere in the submarine zone. A perfectly similar form also occurred by thousands in the upper stratum of Cape Mortela. I do not believe this mollusk existed at Menton at the time of deposits *A* to *F*; but I found a large stout variety always immediately associated with *H. paretiana* at Monaco, Cape Vieille, lower stratum at Cape Mortela, &c. At this last locality it was very interesting to notice how sharply the upper and lower strata were defined by the very marked difference in this species. The stout big variety from the lower stratum reminded me strongly of specimens I found near Bône, in Algeria.

Long. 33, diam.  $11\frac{1}{2}$  millim. Upper stratum, Cape Mortela, like the existing form.

*FERUSSACIA GRONOVIANA*, Risso<sup>1</sup> (as figured by Bourg., diam.  $3\frac{1}{4}$  millim.) (Plate XIV. fig. 2.)

An abundant species here and there in the submarine zone only. I also found it in great numbers at Alassio. Taking a handful of living specimens from under one stone, the great variability in the shape of the whorls, production of the spire, &c. is at once seen; still the aperture and last whorl in especial always present certain characters by which the species can be recognized. The animal has the head, top of neck, and both sets of tentacles, also extreme posterior extremity dark green, almost black; the rest is a very bright greenish yellow.

Long. 10, diam.  $3\frac{3}{4}$ ; another—long. 9, diam.  $3\frac{3}{4}$  millim.

Var. *SUBAMBLA*.

? *Ferussacia ambla*, Bourg. Mal. Alg. (long.  $8\frac{1}{2}$ , diam. 4 millim. Algiers).

This is a short convex form, with the last whorl a good deal more rounded, the aperture less everted, with the columella straight. The whorls increase very slowly and regularly, the difference of the antepenultimate one in this respect, from that of the typical form, being very marked. It may prove a distinct species; but I am inclined to doubt it at present. I only found a few specimens living with typical form.

Long.  $8\frac{1}{4}$ , alt.  $3\frac{1}{3}$  millim.

<sup>1</sup> [Among the examples of this species given me by Mr. G. Nevill I found a good many were still living; these I closely examined. The animal possesses a well-developed mucus-pore at the extremity of the foot, and therefore belongs to the Stenogyridæ of Crosse and Fischer. It is closely allied in its anatomy to the Madeiran form (*Lorca tornatellina*) described by the Rev. R. B. Watson in the P. Z. S. 1875, p. 677, which is of interest as regards geographical distribution. I hope soon to give some details of its anatomy, which I have prepared.—H. H. G.-A.]



## Var. SUBFOLLICULUS.

? *Ferussacia folliculus*, Gronovius (as figured by Bourg. Mal. Château d'If, pl. ii. fig. 2; long. 9, diam. 3 millim.).

A few specimens only met with living with typical *F. gronoviana*; they agree well with the above-quoted figure. The body-whorl is more elegantly and evenly rounded, not tumid towards the base, and appears longer in proportion than in the typical form.

Long. 9, diam.  $3\frac{1}{2}$  millim.; apert. alt.  $3\frac{3}{4}$  millim.

## Var. SUBFORBESI.

? *Ferussacia forbesi*, Bourg. Mal. Alg. (long.  $8\frac{1}{2}$ , diam. 4 millim. Algiers).

I doubt this variety, in especial, being specifically distinct. The whorls of the spire are only slightly irregular; the last whorl more convex, columella straighter. There is also a smaller form, of which I found only two specimens (of which I also give measurements below), which might be separated again as distinct. The aperture is very small.

Long.  $8\frac{1}{2}$ , diam.  $3\frac{1}{2}$  millim., et long.  $8\frac{1}{2}$ , diam.  $3\frac{1}{2}$  millim.

Long.  $7\frac{3}{4}$ , diam. 3 millim. (A small form, perhaps distinct).

All the preceding in Indian Museum, Calcutta. M. Bourguignat informs me by letter that I sent him, from Menton, specimens of *Ferussacia vescoi*, *amblya*, *procchia*, *forbesi*, and *abromea*. He does not mention *F. gronoviana*.

## FERUSSACIA (?) ABNORMIS, n. sp. (Plate XIV. fig. 3.)

*T. parva, subpyriformis, lavigata, nitidissima, vitrea et hyalina; apice obtusiusculo; anfract. 4 (aut  $4\frac{1}{2}$ ), regulariter crescentes, primi 3 parvi, ultimus supra pertumidus, infra subrotundatus; apertura magna, margine externo haud incrassato, regulariter paululum convexo; columellari haud calloso, valde intorta.*

At Blida, in Algeria, under a large stone in company with a species of *Ferussacia* (the latter with bright-greenish-yellow-coloured animal), I found a single specimen of what I took to be the young of a hyaline variety. It struck me at the time that it was of a more tumid shape than ordinary young specimens. Unfortunately I have not this shell available for examination at the present time. At Menton I was much astonished at finding among a lot of *F. gronoviana* (which also possesses a greenish-yellow animal) another, as I thought, young hyaline specimen, also of more tumid form. Unfortunately I took no especial note of the animal, except that it was of a pure hyaline white. On examination of the shell, after death of the animal, I was astonished to find the twisted fold of the columella of a totally distinct nature from that of *F. gronoviana* and its varieties in all stages, so much so that I am inclined to believe that anatomical examination will compel the separation of this species from the true *Ferussacia*. The margins of the aperture not being thickened leaves it a matter of doubt whether the shell is full-grown. I am strongly of that opinion myself, but acknowledge it

is open to doubt. The first 3 or  $3\frac{1}{2}$  whorls increase very slowly and regularly, the last being, especially above, very tumidly, almost globosely swollen, giving it a pyriform appearance; in *F. gronoviana* &c., on the contrary, it is near the base that the whorl is most tumid. The aperture is unusually long, rather narrow; the outer margin scarcely convex, gradually rounded at base, no trace of any callosity joining margins; the columella is quite of a different type. In even very young specimens of *F. gronoviana* it is distinctly callose, is never evenly, spirally, strongly twisted as in *F. (?) abnormis*, but is nearly straight, only slightly though distinctly twisted, there being invariably two of these folds. The hyaline greenish texture is also quite different from the transparent horny brown of its ally.

The characters of the columellar spiral fold are almost exactly represented by the figure of *Streptostyla flavescens*, Shuttl. Notit. Malac. ii. 1878, pl. v. fig. 7, the shell generally of which is also not generically unlike. Can it be that the specimens I found at Blida and Menton prove the genus *Spiraxis*, hitherto supposed to be restricted to the New World, to exist also in Europe?

Long. 6, diam.  $3\frac{1}{2}$  millim.

Type, Indian Museum, Calcutta.

*CÆCILIANELLA EBURNEA*, Risso. (As figured by Bourg. Moll. Alpes-Marit. par Risso, pl. i. figs. 20-22, long. 6, diam.  $1\frac{1}{4}$  millim.)

Not very uncommon in the subarctic zone only; it occurred also at Alassio. I found it also, apparently subfossil and fairly abundant, in deposit *B*. Of course it is possible, from the habits of this mollusk, that these specimens may be recent. I never found the genus actually imbedded in rock, as most of the other forms occurred occasionally, though I especially looked out for it. Mr. Williams did not find the genus in what I call the subalpine zone.

Long. 6, diam.  $1\frac{1}{2}$  millim.

Indian Museum, Calcutta.

*CÆCILIANELLA*, sp. (?)

Not uncommon towards the base of the Grimaldi Hill. A compressed narrow form, of a peculiar green colour. I dare not describe any species of this genus, as I unfortunately do not possess typical specimens of any of M. Bourguignat's species. This may prove to be *C. acicula* or *C. liesvillei*, &c.

Long. 4, diam.  $1\frac{1}{4}$  millim.

Indian Museum, Calcutta.

*CÆCILIANELLA*, n. sp. ?

I procured a single very fine specimen of this well marked form, apparently subfossil, from deposit *B*. The *C. mauriana* of Bourg., from Caunes (Desc. Moll. Alpes-Marit., long. 7, diam.  $1\frac{3}{4}$  millim.), must be somewhat similar, but is described as having eight whorls, the last scarcely bigger than the penultimate one. My Menton

specimen has only six whorls, the last markedly larger than any of the others.

Long.  $7\frac{1}{8}$ , diam. (vix) 2 millim.

Indian Museum, Calcutta.

*CÆCILIANELLA*, sp.

Four or five specimens from deposit *F*, apparently identical with a unique specimen from Alassio. The first three whorls are more convex; and all of them increase more regularly than in the next species. The last whorl is peculiarly evenly convex.

Long.  $4\frac{1}{2}$ , diam.  $1\frac{1}{3}$  millim.

Indian Museum, Calcutta.

*CÆCILIANELLA* (? *MERIMEANA*, Bourg.).

A small form of five whorls, with short spire and very convexly swollen last whorl. Fairly abundant in the submaritime zone. This may be the *C. merimeana* of Bourg., from Cannes (Desc. Moll. Alpes-Marit., long. 5, diam.  $1\frac{1}{2}$  millim.), which, however, is described as having six whorls.

Long.  $4\frac{5}{8}$ , diam.  $1\frac{1}{2}$  millim.

Indian Museum, Calcutta.

*ACME FOLINIANA*, G. Nevill. (Plate XIV. fig. 4.)

*Testa turrato-elongata, imperforata, cornea, laevis et nitida; spira subrecta, paululum prope apicem obtusum eversa; anfractus 6 aut  $6\frac{1}{2}$  [rarissime 7], convexiusculi, sutura distincta separati, interdum inferne linea incisa (more Eulimidarum) circumdati; apertura subcorticalis, subquadrangularis, marginibus callo laevi junctis, columellari subrecto; peristoma album, percrassum, duplex.*

Type, anfr.  $6\frac{1}{2}$ , long.  $5\frac{1}{2}$ , diam.  $1\frac{3}{4}$ ; apert.  $1\frac{1}{4}$ , lat.  $1\frac{1}{10}$  millim.

This was an exceedingly abundant form, often in a perfect state of preservation, in deposits *A*, *B*, and *C*. A few specimens had 7 well-developed whorls, the others 6 or  $6\frac{1}{2}$ , increasing very gradually and regularly, moderately convex, the last two approximate, of equal breadth; apex blunt and obtuse; the apical whorls with a slight inclination to the right (away from the axis of the shell); perfectly smooth, polished, shining, of a more or less pale horny colour, sometimes so transparent that the columella can be traced from the apex to the base; suture distinct, with a more or less obsolete incised line close below it, as in many species of *Eulima* &c.; aperture a trifle everted, subquadrate, with a remarkable pure white callous rib close to the peristome, imparting a duplex appearance to the latter; a thin callosity joins the margins.

I have much pleasure in naming this, the giant of its genus, after my friend the Marquis de Folin, of Bayonne, whose researches connected with minute marine species are so highly valued and appreciated.

Type, Indian Museum, Calcutta; also in coll. Marquis de Folin,

Mons. J. René Bourguignat, Coombe Williams, P. Joly, P. Fagot, and Colonel Godwin-Austen.

Var. EMACIATA, nov. (Plate XIV. fig. 5.)

This is a very difficult dwarf form, apparently varying in every specimen, and of which it seems to me impossible to grasp any thoroughly constant character. Taking an extreme specimen, it is distinguished by its smaller size, by the more regularly turreted spire being quite upright, 6 whorls, of almost equal size, slightly more convex, especially the last, which is also proportionally very short; aperture smaller, a trifle more vertical, and scarcely everted; callosity joining margins well developed; peristome does not present the duplex appearance of the preceding, except at the columella.

Rare, in deposit *B* only.

Long.  $3\frac{1}{8}$ , diam. (vix)  $1\frac{1}{2}$  millim.

Type var., Indian Museum, Calcutta; also in coll. Marquis de Folin and Mons. J. René Bourguignat.

Var. PACHYSTOMA, nov. (Plate XIV. fig. 6.)

(An potius *A. pachystoma*, sp. nov.?)

This, unlike the preceding, is an exceeding well marked and distinct form, unmistakable at a glance. I think it extremely probable Mons. Bourguignat is correct in regarding it as a distinct species. It can be known from the typical form by its much less distinct suture, by the shorter, less elegantly and regularly turreted spire, composed of only 6 more rapidly increasing whorls, the apical two compressed, the others scarcely convex, almost cylindrical, especially the last, which is proportionally much longer, the antepenultimate one much broader than the others (not the case in type form); the apical portion of the spire considerably more diverted from the axis of the shell, with the aperture very much everted, imparting a still stronger resemblance to certain species of *Eulima*; the thick white peristome is surrounded by a still more callous rib, especially noticeable at its termination, about the middle of the columella, which is slightly oblique; the duplex character of this outer lip is still more distinctly and clearly marked. This form was by no means uncommon, though much less abundant than typical *A. foliniana*, with which it was associated.

Long. 5, diam.  $1\frac{9}{10}$  millim.

Type var., Indian Museum, Calcutta; also in coll. Marquis de Folin and Mons. J. René Bourguignat.

RENEA, genus nov.

*Hoc genus delectans ad amicum meum clarissimum J. René Bourguignat dedicavi; ad familiam Aciculidæ, Gray, Acmaeidæ, auct.) pertinet. Testa imperforata, perelongata, cylindrica, unfractibus numerosis, compressis ac costulatis, labro externo prope angulum superiorem (more Pleurotomorum) scissura notabili munito; margine peristomatis obtuso, intus in-crassato, extus costa callosa nulla, sicut semper in genere*

"*Acme*," plus minusve existit. *Species typica* *Renea bourguignatiana*, sp. nov.

This is a very curious little group, evidently closely allied to *Acme*, from which it can be at once distinguished by the deep pleurotomoid sinus, which is visible for some distance along the suture, imparting to the outer lip, when examined from the side, an excessively convex appearance (as it projects sharply forward), also by the entire absence of any external callous rib, such as always exists, more or less developed, in *Acme*. The shell is imperforate, of comparatively thick and shining texture, with much-produced cylindrical whorls and contracted aperture, deeply notched at the suture, with its margins thickened within; the columella is nearly perpendicular, slightly twisted above, and superficially presents an appearance of a channel-like indentation. The sinus itself is as deep as in *Paladilhia pleurotoma*, Bourguignat, but has not the same impressed "*Pleurotomaria*-like" mark along the suture, arising, I suppose, from the fact that the notch in *Renea* is only formed, as in *Pleurotoma*, when the animal is full-grown.

Monsieur Bourguignat has pointed out to me that this genus presents some analogy to the West-Indian *Chittya* of Livesay, which also belongs to this family.

I have taken as my type of the genus the new species which I am about to describe under the name of *Renea bourguignatiana*; another species is the very rare shell described as *Acme mentoni* by Dupuy, Cat. Extram. Gall. Test. No. 4, 1849, and Hist. Moll. pl. xvii. fig. 3, from "under bushes at Grasse."

*RENEA BOURGUIGNATIANA*, n. sp. (Plate XIV. fig. 7.)

*Testa imperforata, elongata, omnino cylindrica, sat solidula, nitens, cornea, eleganter ac confertim costata; spira regulariter producta, apice lævigato, perobtusio; anfractus 7½, convexiusculi, sutura profunda separati, supremi 2½ lævigati, aut sculptura obsoleta, alteri fere æquales, perlente ac regulariter crescentes, anfract. ult. inferne distincte angulatus, superne prope suturam in scissuram terminans, læviter sulcatulus, costis persinuatis, ad basim evanidis; apertura parva, verticalis, subquadrangularis, ad basim angustata, superne sinu profundo munita; perist. intus album, valde incrassatum, marginibus callo distincto junctis, externo quasi perconvexo ac medio introrsum prominente; columella superne sinuata, subrecta, inferne acute angulata.*

Long. 4, diam. 1 millim.

This interesting form would appear to have been formerly fairly abundant, though not nearly so much so as *Acme foliniana*, with which it is always associated. We procured from deposits *A*, *B*, and *C* about thirty or forty perfect specimens. The sculpture is very remarkable; the two apical whorls are smooth and shining, the next two slightly more convex than any of the others, their sculpture is more or less subobsolete; the next two are of equal size, slightly convex, with almost vertical, distinct, and very close-pressed ribs, the antepenultimate one is a shade larger, fairly convex, and with

distinctly sinuated sculpture; the last whorl, scarcely convex, is somewhat abruptly angulate (or furrowed) at the columella, and again very delicately and more or less obsoletely (requiring careful examination with a lens to detect) just below the suture, terminating in the labial incision; these two furrows correspond, of course, with the sculpture; the aperture is always more or less contracted, especially at its base; within, the peristome is thickened with a white callosity, terminating at the sinus. I should describe the columella as twisted and contorted; but Monsieur Bourguignat may be perhaps more correct in saying:—"Columelle offrant à sa partie supérieure un renforcement canaliforme, ce qui la fait paraître vers le bas comme torsée et lamellée." The species varies very little; there is a slightly dwarf emaciated form, with the spire twisted like some of the *Eulimæ*, and with the aperture even more contracted.

Type, Indian Museum, Calcutta; also in coll. J. R. Bourguignat, Coombe Williams, P. Joly, and Colonel Godwin-Austen.

The specimen figured has been since accidentally broken.

POMATIAS PATULUS, Drap., (?) var. MONTANA, Issel.

An abundant and somewhat variable species on the "Grand Mont," and "Berceau," at 3000 to 4000 feet. Very likely this is the var. *montana* of Issel.

Long. 8, diam.  $3\frac{3}{4}$  millim; another, long.  $6\frac{1}{2}$ , diam.  $3\frac{1}{2}$  millim. "Grand Mont."

POMATIAS SEPTEMSPIRALIS, Razoum.

An exceedingly common subfossil species in deposits *A*, *B*, *C*, *D*, *E*, and *F*. I did not find it myself associated with *H. paretiana*; but M. Bourguignat did so in a cutting of the railroad at Cape Vieille. We did not find the species living; nor is it recorded from the Department by Risso. Mme. Paulucci, however, records a var. *turricula* from the Alpes Apennines, in her 'Faune Mal. Italie,' which will probably prove identical with this subfossil variety; in any case it is quite a distinct form from Swiss specimens of this species, in which the umbilicus is completely covered, the more convex whorls less turriculate, the last much less broad in proportion, the aperture less everted, the sculpture of the last whorl similar to that of the preceding ones, instead of being finer, more crowded together, more flexuous and less oblique, &c. I found endless varieties of the Menton form; but all preserve a totally different aspect from their more northern (and typical) form.

Long.  $7\frac{3}{4}$  to 8, diam.  $3\frac{3}{4}$  to 4 millim. The commonest form.

Long.  $8\frac{3}{4}$ , diam.  $3\frac{3}{4}$  millim. A subvar. *major*.

Long.  $6\frac{1}{2}$ , diam.  $3\frac{3}{4}$  millim. A not uncommon subvar. *nana*.

POMATIAS HERCULEUS, Bourg. MS. (Plate XIV. fig. 8.)

I am indebted to M. Bourguignat for the following Latin diagnosis:—

"*T. subrimata, sat elongata, acuminato-turrita, in anfractu pen-*

*ultimo sat ventricosa, albidula, olim passim fusco flammulata, costata (costæ parallelæ, sat distantes, validæ in anfractibus medianis, in ultimo strictæ, magis approximatae, ac prope aperturam evanescentes); spira acuminato-producta; apice lævigato, obtuso, mamillato; anfractibus 10, convexis, lente crescentibus, sutura profunda separatis; anfractibus medianis leviter tumidis; ultimo vix majore, rotundato, ad aperturam undique dilatato ac expanso, et ad insertionem labri ascendente; apertura fere verticali, rotundata, exacte pervia, superne vix subangulata; peristomate acuto, intus profunde leviterque incrassato ac fere undique expanso, marginibus callo junctis, margine columellari valde auriculato ac reflexo; operculo ignoto.*

"Alt. 10, diam. 4 millim.

"Couche à *Helix paretiana*, dans la tranchée du chemin de fer, au Cap Vieille, entre Roquebrune et Monaco."

I found this species rather scarce in deposit *D*. My limited knowledge of the European species of this genus hardly entitles me to pronounce an opinion about it; I will only say that my subfossil form from deposit *D* is indubitably, specifically, quite distinct from that which abounds in the other deposits, and which M. Bourguignat informs me is the *Pom. septemspiralis*. I am further indebted to my distinguished friend for informing me, *in litt.*, that *Pom. herculeus* is most nearly allied to *Pom. simonianus*, from which it can be distinguished by its greater size, stronger and more regular sculpture, different coloration (approximating much nearer to that of *Pom. septemspiralis*), more regularly acuminate spire, less convex whorls, with suture less distinct, by its more ample aperture, "s'épanouissant à l'instar du pavillon d'un cor de chasse, &c."

Type in coll. cl. Bourguignat; also Indian Museum, and Coombe Williams, Esq.

#### CYCLOSTOMA ELEGANS, Müller.

Living specimens of this widely distributed species are to be found near Menton, here and there, from the neighbourhood of the sea up to some 2000 feet at least. Mr. Williams did not bring me back any specimens from the higher altitudes. A single specimen my friend found on the summit of the Grand Mont was a quite different species (probably *C. sulcatum*, var.), closely allied to the also undoubtedly distinct (from *C. elegans*) subfossil forms from the zone of *H. paretiana* and deposits *A*, *D*, &c., identified for me by M. Bourguignat as his *C. lutetianum* and *C. physetum*. Certain subfossil specimens I found in the couche marneuse of Cape Mortela, in the upper stratum [that is, zone of *H. aspersa*, *H. vermiculata*, *H. cespitum*, &c.], show how difficult all these forms are to correctly classify. M. Bourguignat regards them also as belonging to his *C. physetum* and *C. lutetianum*. I am convinced they are merely subvarieties of *C. elegans*, and specifically quite distinct from their above-quoted older relatives.

Alt.  $14\frac{1}{2}$ , diam.  $10\frac{1}{2}$ ; apert. (cum. marg.) alt. 7, lat.  $6\frac{1}{4}$  millim. A living specimen of the ordinary type.

Alt.  $16\frac{1}{2}$ , diam. 12; apert. alt. 8 (vix), lat. 7 millim. Specimen from upper stratum, Cape Mortela. Identified by M. Bourguignat as his *C. physetum*, considered by me merely a form of *C. elegans*.

Alt.  $10\frac{3}{4}$ , diam.  $10\frac{3}{4}$ , apert. alt. 7, lat.  $6\frac{1}{4}$  millim. From the preceding locality; identified by M. Bourguignat as *C. lutetianum*; an elongate subvar. of *C. elegans* in my opinion.

CYCLOSTOMA SULCATUM (?), Drap., var. (var. *reticulata*, Zgl.).

The single living specimen already alluded to, found at 4000 ft. on the "Grand Mont," is most certainly quite distinct from *C. elegans*. There are two described species to which it may belong, *C. sulcatum* or *C. physetum*; or, what seems to me likely enough, it may be both; that is, these two species may prove not separable except as varieties. The specimen does not agree exactly with the subfossil ones identified by M. Bourguignat as his *C. physetum*. To me it seems an extreme variety, differing more from the *C. elegans* type as to the shorter spire, more convex whorls, and globosely swollen last whorl, but less as regards coarseness of the sculpture; the umbilicus and aperture with its margins seem to be exactly similar. They differ so widely from Algerian specimens of *C. sulcatum* that I am in doubt whether both ought not to be separated as *C. physetum*. Unfortunately I have not got with me any typical French specimens of *C. sulcatum* for comparison.

Alt.  $16\frac{3}{4}$ , diam.  $13\frac{1}{2}$ ; apert. alt.  $8\frac{1}{2}$ , lat.  $7\frac{3}{4}$  millim.

Unique specimen from the "Grand Mont."

CYCLOSTOMA LUTETIANUM, Bourg. Moll. Diluvium, Paris, pl. iii. figs. 35-37, 1869.

One of the most abundant shells in deposits *A*, *B*, *C*, *D*, and *E* (the genus did not occur at all in deposit *F*). One of the forms I include under the above heading was invariably to be found wherever *H. paretiana* occurred, both at Cape Mortela and Cape Vieille &c., M. Bourguignat identifying it as his *C. lutetianum*. I did not find in this zone any specimen of what I consider a variety only, and what M. Bourguignat calls *C. physetum*.

In deposits *A* and *D* especially these two so-called species, varying in every specimen, and running into one another from the extreme of one form to that of the other, were to be found mixed up together under one rock, leaving in my mind not the slightest doubt as to their being varieties of one single species, most certainly quite distinct from *C. elegans*, possibly extreme varieties of the living form *C. sulcatum*, or perhaps a distinct species. I think they are very doubtfully specifically separable from the preceding living specimen, which, however, I have thought best temporarily to separate as a variety of *C. sulcatum*. Specimens from deposit *D* had a distinct tendency to coarser sculpture than those from other localities.

Alt.  $21\frac{1}{6}$ , diam.  $14\frac{1}{6}$ ; apert. alt. 9, lat.  $8\frac{1}{6}$  millim.

An elongate specimen from deposit *D*, with the aperture widely detached from the body-whorl.

Alt.  $16\frac{1}{2}$ , diam.  $12\frac{3}{4}$ ; apert. alt.  $7\frac{1}{2}$ , lat. 7 millim.



A smaller commoner form from deposit *A*.

Alt.  $18\frac{1}{2}$ , diam.  $13\frac{1}{2}$ ; apert. alt. 9, lat. 8 millim.

Specimens from Cape Mortela, imbedded close to a *H. paretiana*.

Var. ? *PHYSETUM*, Bourg.

*C. physetum*, Bourg. Rev. & Mag. Zool. 1875, = *C. subelegans* Bourg. not Orb., Moll. Diluv. Paris, 1869, fide cl. Bourguignat.

I feel no hesitation in uniting this form specifically to the preceding; in doing so I by no means wish to imply that typical *C. lutetianum* and *C. physetum* are not distinct, as I have had no opportunities of studying the types of these shells from the original figures.

Alt.  $18\frac{1}{2}$ , diam.  $13\frac{3}{4}$ ; apert. alt.  $8\frac{1}{2}$ , lat. (vix) 8 millim.

A specimen from deposit *D*, nearest the living specimen from the "Grand Mont," and consequently with the most globosely swollen last whorl.

Alt.  $18\frac{1}{2}$ , diam. 13; apert. alt.  $8\frac{1}{4}$ , lat.  $7\frac{1}{2}$  millim.

A much commoner form in all the deposits, with the last whorl markedly less tumid.

Alt.  $16\frac{1}{2}$ , diam.  $12\frac{1}{2}$ ; apert. alt.  $7\frac{3}{4}$ , lat. 7. millim.

The smallest form, found only in deposit *A*, not in the least like *C. elegans*.

## EXPLANATION OF THE PLATES.

### PLATE XIII.

- Fig. 1. *Testacella williamsiana*, p. 101.  
 2. *Daudebardia isseliana*, p. 102.  
 3. *Hyalina mentonica*, p. 107.  
 4. *Pupa obliqua*, p. 126.  
 5. ——— *bourguignatiana*, p. 127.  
 6. ———, var. *plagiostoma*, p. 128.  
 7. ———, var. *præclara*, p. 129.  
 8. ——— *jolyana*, p. 129.  
 9. ——— *austeniana*, p. 130.

### PLATE XIV.

- Fig. 1. *Clausilia paulucciana*, p. 132.  
 2. *Ferussacia gronoviana*, p. 133.  
 3. ———, var. *abnormis*, p. 134.  
 4. *Acme foliina*, p. 136.  
 5. ———, var. *emaciata*, p. 137.  
 6. ———, var. *pachystoma*, p. 137.  
 7. *Renea bourguignatiana*, p. 138.  
 8. *Pomatias herculeus*, p. 139.

March 2, 1880.

Prof. St. George Mivart, F.R.S., Vice-President, in the Chair.

The following papers were read:—

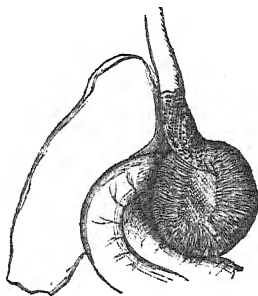
1. Contributions to the Anatomy of Passerine Birds.—Part I.  
On the Structure of the Stomach in certain Genera of Tanagers. By W. A. FORBES, B.A., F.L.S., Scholar of St. John's College, Cambridge, Prosector to the Society.

[Received February 16, 1880.]

Under this heading I propose to continue from time to time, as material may occur, the "Notes on the Anatomy of Passerine Birds," of which the late Prof. Garrod published four parts in the Society's 'Proceedings'<sup>1</sup>.

In the vast majority of Passerine birds the structure of the anterior part of the alimentary canal conforms to the type present in the Fowl—that is to say, to an œsophagus, which may or may not

Fig. 1.



Stomach of *Tachyphonus melaleucus*, natural size, undisturbed, and viewed from behind. The liver, œsophagus, and small intestine are also partially represented.

be dilated into a crop, succeeds a stomach consisting of two parts:—an anterior glandular part, the *proventriculus*; and a posterior part, separated off from both proventriculus and duodenum by more or less distinct constrictions—the gizzard or *ventriculus*, of which the muscular walls are always more or less thickened, and provided with a central tendon on each side (*vide* fig. 1).

<sup>1</sup> Part I. P. Z. S. 1876, p. 506; Part II. 1877, p. 447; Part III. 1877, p. 523; Part IV. 1878, p. 143.

As was first pointed out by Lund, half a century ago, a singular exception to this rule obtains in the Tanagers of the genus *Euphonia*<sup>1</sup>.

From his description (quoted below) and figures, it is quite evident that Lund considered that there was, in these birds, an intermediate zone devoid of glands or muscles, between the proventriculus and the commencement of the small intestine, and that a small lateral diverticulum springing from this zone was also present, representing the true, though rudimentary, gizzard. Lund found, as he believed, this state of things in three species of *Euphonia*, whilst the normal type of stomach existed in sixteen other species of Tanagers which he examined. Lund's description has frequently been copied since in various text-books, and his figures at least three times reproduced<sup>2</sup>.

Mr. Sclater having called my attention to this subject, I have been able, thanks to the resources of the Prosecutor's department and to the material afforded by Mr. Salvin, to reexamine this question. I have been able repeatedly to dissect specimens of various species of *Euphonia*, both preserved in spirit and quite fresh. I can fully confirm Lund's description in all points, except as regards the presence of a small lateral diverticulum from the alimentary canal, of which I have never been able to find the slightest trace, though I have always carefully looked for it.

Fig. 2 (p. 145) will show the structure of this part of the alimentary canal, with the parts as little disturbed as possible, but with the stomach &c. cut open from behind, in a perfectly fresh specimen of *Euphonia violacea*. As will be seen, between the glandular proventriculus and the villi-covered duodenum a narrow zone is interposed, with its walls in no degree thickened, but thin and membranous, and of rather greater calibre than the adjacent parts, there being no pyloric constriction. Moreover there is none of that approximation of the cardiac and

<sup>1</sup> In a pamphlet entitled "De genere *Euphones*, præsertim de singulari canalis intestinalis structura in hocce avium genere, autore Dr. Peter Wilhelm Lund," published at Copenhagen in 1829 (31 pages and 1 plate).

This pamphlet being rather scarce, I here give Lund's own words:—

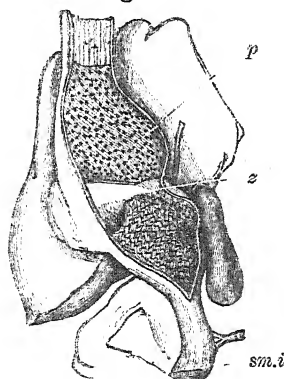
"§ 13 (p. 12). Ubi incipit intestinum tenue, ibi conspicitur in externa superficie angustæ illius zonæ, quæ locum ventriculi occupare videtur, minima quædam protuberantia, cui intus respondet levis quædam impressio. Opaca est parvula hæc protuberantia; quare in parietibus fibras musculosas continet non dubito; hoc vero, propter minimam ejus molem, decidere vix valebis . . . . Ad eam sententiam maxime inclinare animam, ut statuum verum esse hoc ventriculi analogon, haud diffiteor.

"§ 14. Hæc si vera judicetur cogitandi ratio, referas licet structuram hujus avis ad formam avium generalem; ita enim habebimus, uti solet, musculosum nostrum organon e latere intestini exortum, interque proventriculum et intestinum tenue positum; neque a forma generali avium aberrat hæc structura, nisi in eo, quod ad minimum quoddam rudimentum reductus est ventriculus: contra, si zonam illam, de qua mentionem fecimus, angustam pellucidamque, quæ inter proventriculum et intestinum tenue invenitur, analogon esse ventriculi statuamus, constantes duo maximeque essentielles ventriculi avium characteres subruentur, in muscosa structura, ortuque laterali positi."

<sup>2</sup> Carus and Otto, Tab. Anat. Comp. Illustr. 1835, pt. iv. tab. vi. figs. 4, 5; Wagner, Icones Zool. iii. t. xi. figs. 3, 4; Brühl, Zoot. aller Thierkl. Lief. iii. pl. ix. fig. 13 a.

pyloric ends of the stomach that obtains in most other birds. There is no trace of any external diverticulum to be seen; and I therefore can only conclude that Lund must have been misled, he, owing to the bad condition of his specimens (a very probable contingency when dissections are made in tropical climates), having mistaken a bit of fat or connective tissue for a diverticulum of the ventriculus, which last there can be no doubt that this non-glandular zone really represents, the muscular walls and hard epithelium of the true Passerine gizzard being almost entirely undeveloped<sup>1</sup>.

Fig. 2.

Stomach of *Euphonia violacea*.

A portion of the alimentary canal of *Euphonia violacea*, twice the natural size, cut open and seen from behind, to show the proventriculus (*p*), the narrow zone representing the gizzard (*z*), and the commencement of the small intestine (*sm.i*). The liver and spleen are also seen, as is the end of the œsophagus, which is opened up.

I have also been able to ascertain that the nearly allied genus *Chlorophonia* (at least in *C. viridis*) is characterized by the same non-development of a gizzard. On the other hand, all Tanagers yet examined belonging to other than these two genera have stomachs constructed on the normal type. Thus in a specimen of *Tachyphonus melaleucus* (see fig. 1, p. 143) the characteristic gizzard with the two central tendons is present and well developed, the muscular walls being nearly  $\frac{1}{4}$  inch thick, and the epithelium lining it hard and horny. As might have been expected, considerable variations in the comparative development of these parts occur in different genera. Thus in the thick-billed *Pitylus* the whole organ is much more strongly

<sup>1</sup> In confirmation of the above-mentioned view being correct, I may notice that neither Owen (Anat. Vert. ii. p. 106) nor Gadow (Jen. Zeitschr. B. xiii. p. 168, 1879), when mentioning the stomach of *Euphonia*, describe any lateral diverticulum. Prof. Garrod, in his MS., notes of *Euphonia violacea*, with characteristic terseness, "No stomach specialized, the intestines apparently continuing from the œsophagus."

developed than in the more slender-billed genera *Tanagra*, *Calliste*, &c. Why the genera *Euphonia* and *Chlorophonia* alone, as far as it is yet known, of birds should present this structure is an as yet unsolved problem; I believe they differ in no appreciable degree from other Tanagers in food<sup>1</sup> or habits. I may also remark that in such genera as *Coccyzina* and *Aethopyga*, feeding chiefly on minute insects and juices of flowers, there is a well-marked gizzard, with muscular walls and hardened epithelium.

Subjoined is a list of all those species of Tanagers, 27 in number belonging to 11 genera, in which the condition of the stomach is as yet known. This includes the species mentioned by Lund (L.), as well as those examined by the late Prof. Garrod (A. H. G.) and myself, and the nomenclature is that of the 'Nomenclator,' Mr. Selater having kindly reduced Lund's names to the terms of that list for me.

*Tanagers with a normal  
stomach.*

*Calliste tricolor* (L. & W. A. F.).  
 — *festiva* (L. & A. H. G.).  
 — *cyaneiventris* (L.).  
 — *thoracica* (L.).  
 — *melanonota* (L.).  
 — *nigricapilla* (W. A. F.).  
*Tanagra episcopus* (L.).  
 — *ornata* (L.).  
 — *abbas* (W. A. F.).  
 — *sayaca* (W. A. F. & A. H. G.).  
 — *palmarum* (L. & A. H. G.).  
*Rhamphocelus brasilius* (L.).  
 — *jacapa* (W. A. F.).  
*Pyrrhuloxia erythromelana* (W. A. F.).  
*Trichothraupis quadricolor* (L.).  
*Tachyphonus melaleucus* (W. A. F.).  
 — *cristatus* (L.).  
 — *coronatus* (L.).  
*Saltator magnus* (L.).  
*Cissopis leveriana* (W. A. F.).  
*Pitilus fuliginosus* (W. A. F.).

Two other species not named  
by Lund.

*Tanagers with the stomach  
abnormal.*

*Chlorophonia viridis* (W. A. F.).  
*Euphonia chlorotica* (L.).  
 — *trinitatis* (W. A. F.).  
 — *violacea* (L., A. H. G., &  
 W. A. F.).  
 — *rufiventris* (L.).  
 — *pectoralis* (W. A. F.).

*Piprida melanonota* is mentioned by Lund (under the name *Tanagra vittata*) as one of the species with a normal stomach. On the other hand, according to M. Taczanowski (P. Z. S. 1879, p. 226), Stolzmann found in this bird "la poche stomacale rudimentaire,"

<sup>1</sup> Several of the wild specimens of *Euphonia* that I have dissected have had in their intestines a large number of small round reddish seeds, which are probably, Mr. Salvin tells me, those of a climbing species of *Ficus* common in the Central-American forests.

and consequently considers that it is nearly allied to the *Euphonia*. It is to be hoped that we shall know ere long which of these statements is correct. It would be also highly desirable to ascertain the structure of the stomach in the other genera placed near to *Euphonia*, particularly that of the genus *Procnias*. I propose on some future occasion to publish a supplementary list describing the condition of the stomach in any other forms that I may have an opportunity of examining.

## 2. On new and little-known Butterflies from India.

By ARTHUR G. BUTLER, F.L.S., F.Z.S., &c.

[Received February 17, 1880.]

(Plate XV.)

The following species were collected by Dr. Watt, Professor of Botany in the Calcutta University; some of them I enumerate for the sake of the notes on habits and date of appearance which accompany them, and others because they prove to be new to science.

### Nymphalidæ.

#### Satyrinæ, Bates.

##### 1. AULOCERA BRAHMINUS.

*Satyrus brahminus*, Blanchard, Jacquem. Voy. dans l'Inde, iv. Ins. p. 22. n. 18, pl. 2. fig. 4, ♂.

*Aulocera werang*, Lang, Ent. Month. Mag. iv. p. 247 (1868).

Ravee Basin, up to 6000 feet.

Mr. Moore kindly pointed out to me that the sexes figured by Blanchard are referable to distinct species, the male being the *A. werang* of Lang.

##### 2. HIPPARCHIA DIFFUSA, n. sp.

♀. Closely allied to *H. semele*, from which it principally differs in the obscured and diffused character of the ochraceous patches enclosing the ocelli on the upper surface of the primaries; on the under surface the white belt is well marked, more so than in any specimens of *H. semele* which I have seen. Expanse of wings 2 inches 1 line.

Ravee Basin.

##### 3. EREBIA KALINDA.

*Erebia kalinda*, Moore, Proc. Zool. Soc. 1865, p. 501. n. 92, pl. 30. fig. 5.

In pine-forests, Ravee Basin, up to 12,000 feet.

##### 4. CALLEREBIA HYBRIDA.

Dr. Watt obtained a series of a *Callerebia* exhibiting intermediate forms between *C. annada* and *C. nirmala*. In the coloration of the

under surface of the primaries they agree almost entirely with *C. nirmala*, but show the submarginal stripe strongly as in *C. annada*; on the underside of the secondaries they are coloured like *C. annada*, but have rounded ocelli varying in number from two to five. In expanse they are intermediate, and therefore correspond with *C. scanda* in this respect.

N.W. Himalayas, up to 6000 feet.

5. *YPHTIMA ORDINATA*, n. sp. (Plate XV. fig. 3.)

Nearly allied to *Y. lisandra*, rather darker: primaries above with the ocellus less widely zoned; secondaries with three ocelli in an oblique decreasing series from third median branch to anal angle: wings below decidedly browner, the transverse stripes less prominent; secondaries with six ocelli forming a regular but interrupted series, two at apical angle and two on median interspaces of nearly equal size, and two smaller, unequal and confluent, at anal angle; all these ocelli have a single small plumbageous pupil. Expanse of wings 1 inch 5 lines.

One specimen. Bengal.

The ocelli on the under surface of secondaries in *Y. lisandra* form a distinctly irregular series, and are generally much less uniform in size.

NYMPHALINÆ, Bates.

6. *CHARAXES WATTI*, n. sp. (Plate XV. fig. 2.)

♂. Allied to *C. baya* and *C. affinis* (see P. Z. S. 1865, pl. xxxvii.); but differing from the former in the absence of the white pupils in the black submarginal spots on the upper surface of secondaries; from the latter in the greater size and more distinctly diamond-like shape of these spots, and the much more regular inner margin of the broad black border of primaries; and from both in the coloration of the under surface, which is dull clay-yellowish washed with shining lilacine grey, excepting upon the outer borders and on the lunated discal belt bounding the submarginal ocelloid spots internally; bands indicated by black lines edged externally with white; margins and lunated belt dull ferruginous brownish. Expanse of wings 3 inches 6 lines.

Bishnath, Upper Assam, August 1877.

Only one example was taken; but Dr. Watt says that it is not uncommon.

7. *LIMENITIS TRIVENA*.

*Limenitis trivena*, Moore, Ent. Month. Mag. i. p. 133, note (Nov. 1864).

Ravee Basin, N.W. Himalayas, on wooded slopes near water.

8. *NEPTIS MAHENDRA*.

*Neptis mahendra*, Moore, Proc. Zool. Soc. 1872, p. 560, pl. 32. fig. 3.

Common in the Ravee Basin; one specimen also taken in the

Chundrabagha valley at 9000 feet elevation in wooded valleys; flying with a floating flight amongst trees near water.

9. *MELITEA BALBITA*.

*Melitæa balbita*, Moore, Proc. Zool. Soc. 1874, p. 268, pl. 43. fig. 5.

Northern slopes of N.W. Himalayas, Chundrabagha region.

LYCÆNIDÆ.

Amongst the Lycænidæ Dr. Watt has obtained both sexes of *Lycæna ariana*, *Lampides dipora*, *Thecla syla*, *T. icana*, the female of *T. birapa* and *T. odata*; also examples of *Chrysophanus kasyapa*, *Deudorix selira*, *Ilerda androcles*, *I. tamu*, and *I. sena*. Of these, the most interesting is the female of *Thecla icana* of Moore, which is of a dark smoky brown above, with two bright ochreous spots placed obliquely beyond the discoidal cell of the primaries; it is rather larger than the male, measuring 1 inch 8 lines in expanse.

PAPILIONIDÆ.

PIERINÆ, Bates.

10. *TERACOLUS TRIPUNCTATUS*. (Plate XV. fig. 4.)

♂. *Idmais tripuncta*, Butler, Proc. Zool. Soc. 1868, p. 221, pl. 17. fig. 9.

♀. Above very like the female of *T. fulvia*, but only three cream-coloured spots on the apical area of primaries above, and the marginal spots of secondaries larger and confluent; one or two blackish dashes on the disk upon the subcostal and discoidal interspaces. Primaries below bright sulphur-yellow, washed with saffron upon the costa, apical area, and external border; the internal area white; discoidal stigma large and grey with black margin; seven spots across the disk, the first five ferruginous, the last two black, the third and fourth considerably more elongated than the others, the last placed further from the margin; seven marginal squamose blackish spots; fringe rose-red: secondaries bright saffron-yellow, washed upon outer border with rose-red; a small discoidal ocelloid spot and a discal series of seven spots in a subfalciform series, ferruginous: body below cream-coloured, sprinkled with saffron-yellow. Expanse of wings 2 inches.

Nilgherries, above 6000 feet; flying on grassy slopes near streams.

In the absence of specimens of this species in any available collection, it has been supposed to be no more than a slight variety of *T. fulvia* of Wallace; a comparison of the female above described with the type specimens of Wallace's species proves that I was fully justified in separating it as a perfectly distinct species, the coloration of the under surface in *T. fulvia* being creamy and consequently quite unlike *T. tripunctatus*. I have slightly altered the name so as to adopt the orthodox adjectival termination.



11. *TERACOLUS FARRINUS*, ♂.

*Teracolus farrinus*, Butler, Proc. Zool. Soc. 1876, p. 159. n. 112, pl. 7. fig. 2.

On the railway-embankment near Lahore.

Dr. Watt says that this species is not uncommon; he, however, only brought home one example, which he presented to the National collection.

12. *IXIAS AGNIVERNA*.

*Ixias agniverna*, Moore, Ann. & Mag. Nat. Hist. ser. 4, vol. xx. p. 50 (1877).

Bengal.

Dr. Watt took this species in company with *I. mariannæ*.

13. *IXIAS DHARMSALÆ*, n. sp. (Plate XV. figs. 8, 9.)

♂. Bright lemon-yellow: primaries above with the base tinted with greenish grey; costal margin and apical half (enclosing a broad orange belt, divided by black veins into eight areas) black; lower discocellular bounded internally by a nearly semicircular black spot, which is partially confluent with the inner border of the apical area, the latter reduced by the orange belt to a rather slender stripe: secondaries with a moderately broad, undulated, dark-brown outer border: body greenish, with the prothorax slightly reddish in front. Wings below of a less clear yellow than above, irrorated here and there with little brown mottlings; internal area whitish; a dark-brown spot on the angle of the discocellulars; veins terminating in black dots: primaries with an indistinct zigzag series of squamose brown spots on the disk from the costa to the third median branch; secondaries with a red-brown spot on costal area near apex and three others of different sizes on the inferior subcostal, radial, and third median interspaces. Expanse of wings 2 inches 4 lines.

♀. Bright sulphur-yellow: wings above with the black areas nearly as in the male, but the belt of primaries sulphur-yellow traversed by four transverse diffused black spots, the third of which is alone separated from the black veins and surrounding black area. Primaries below (excepting the apex, costa, and outer border, which are lemon-yellow, and the internal area, which is whitish) sulphur-yellow; veins at apex and outer margin orange; terminal black dots and discocellular spots nearly as in the male; a discal elbowed series of six spots, the three uppermost of which are ferruginous and the remainder blackish; a blackish squamose patch at external angle: secondaries more strongly mottled than in the male, with two additional small red-brown discal spots, thus forming a series of six, of which the first, third, and fourth are large and the three others small and decreasing in size from the costal area downwards: body paler than in the male. Expanse of wings 2 inches 3 lines.

Dharmasala, N.W. Himalayas, 7000 feet.

Mr. Moore has a series of this beautiful species in his collection.

14. *IXIAS FREQUENS*, n. sp. (Plate XV. figs. 6, 7.)

♂. Above very similar to the preceding, but the orange belt of primaries more regular in outline and slightly yellower, basal area darker; secondaries with a broader and internally diffused outer border: wings below clearer, not mottled, the apical area of primaries slightly dusted with grey scales; veins terminating in minute black dots, and similar dots on the angle of the discocellulars. Expanse of wings 2 inches 4 lines.

♀. Above bright lemon-yellow, the basal area heavily irrorated with grey and brown scales: primaries with the costal border and apical half black-brown, the latter crossed by a rather broad zigzag pale orange belt bordered with yellow and crossed by black veins, separated at the third median branch, below which it is crossed by two black spots, the lower one confluent with the blackish ground-colour: secondaries with broader outer border than in the male. Wings below altogether different: primaries sulphur-yellow, sprinkled, especially upon apical area, with brown scales; a large dark brown discocellular spot crossed by a yellow vein; a discal series of six spots, the three upper ones placed obliquely, pale brown with whitish pupils, the others black; a large blackish patch at external angle: secondaries pale sulphur-yellow, sparsely sprinkled on basal area with black scales; external area irrorated with brown; veins terminating in black dots; a small black spot on the angle of the discocellulars; a discal series of seven unequal spots in an arched series, pale reddish brown with white centres; venter white. Expanse of wings 2 inches 3 lines.

Bengal.

15. *IXIAS WATTI*, n. sp. (Plate XV. fig. 1.)

Also allied to *I. dharmsalæ*, but the base more densely obscured by blackish scales; the orange belt narrower and of a deeper colour: secondaries with the outer border wider, diffused and broken up by yellow internervular folds into large spots; body blacker. Wings below sulphur-yellow, sparsely irrorated with blackish scales, with small black discocellular and marginal dots: primaries showing traces of the orange belt through the wing; two brown dots placed obliquely beyond it upon the subcostal interspaces: secondaries with a discal series of seven saffron-yellow spots in an arched line, the fourth largest. Expanse of wings 2 inches 5 lines.

Bengal.

The following species was taken by Dr. Watt during a recent excursion into Tibet:—

16. *EUCHLOË VENOSA*, n. sp. (Plate XV. fig. 5.)

♂. Allied to *E. daphalis*, which it much resembles above, excepting that it is considerably larger, has the apical area of primaries darker and the white spots consequently better defined, the discocellular spots decidedly larger and the markings of the under surface more distinctly visible through the secondaries. Below it is quite

different in colour: primaries snow-white with black dotted costa; a black reniform spot intersected by the lower discocellular veinlet, which is white; apical area dark olive-green spotted with white, as in *E. simplonia*: secondaries dull olive-green, with pale buff veins and silvery-white spots, and abbreviated irregular bands similar to those of *E. simplonia*. Expanse of wings 1 inch 10 lines.

♀. Differs from the male above in the darker apex of the primaries and the more distinctly visible under-surface markings upon the secondaries: below in the bright sap-green apical area of primaries and ground-colour of secondaries, and the bright orange colouring of the veins on the latter wings. Expanse of wings 1 inch 10 lines.

Western Thibet.

#### HESPERIIDÆ.

##### 17. ANTIGONUS VASAVA.

*Achlyodes vasava*, Moore, Proc. Zool. Soc. 1865, p. 786.

Upper Assam, 19th March, 1877.

#### EXPLANATION OF PLATE XV.

Fig. 1. *Ixias watti*, p. 151.

2. *Charaxes watti*, p. 148.

3. *Ypthina ordinata*, p. 148.

4. *Teracolus tripunctatus*, p. 149.

Fig. 5. *Euchloë venosa*, p. 151.

6, 7. *Ixias frequens*, p. 151.

8, 9. *Ixias dharmasæ*, p. 150.

### 3. Description of a new Species of Orthopteron of the Genus *Anostostoma* from Madagascar. By ARTHUR GARDINER BUTLER, F.L.S., F.Z.S.

[Received February 20, 1880.]

The following remarkable Orthopteron was obtained last year from a collection of insects made at Antananarivo by Mr. Kingdon.

Being a winged species, I should have supposed this insect to be referable to a genus distinct from *Anostostoma*, had not the experienced Orthopterist Herr Brunner von Wattenwyl kindly examined it for me and assured me that, although an aberrant form, it undoubtedly belonged to that group.

The species is readily distinguishable from the other described forms, not only by the possession of elytra and wings, but by many other particulars of structure, notably by the well-marked transverse crest upon the front of the face and just above the insertion of the mandibles.

#### ANOSTOSTOMA ALATUM, n. sp.

Length from vertex of head to extremity of abdomen 29 millims.; from vertex to extremity of labrum 16 millims.

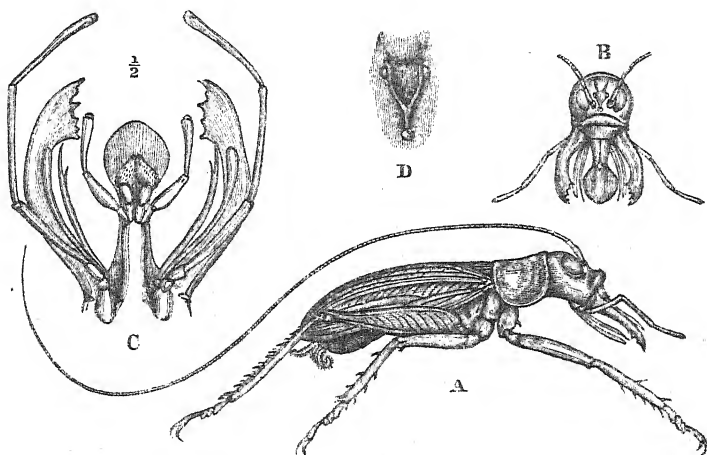
*Male*. Greenish brown, becoming darker when dry; face, mandibles, margins of prothorax, and knees blackish piceous.

*Head* large (but apparently not so much so as in *A. cuniculator*),

inclined downwards, rugulose beyond the eyes, otherwise smooth; swollen at the sides, with a distinct marginal ridge; a nearly Y-shaped ridge between the eyes connecting the three ocelli, which are smooth and of an amber-brown colour, the two posterior ocelli placed on the outer margins of the furca of the ridge facing the insertion of the antennæ; front of head crossed by a broad shining swollen crest, in front of which the face is distinctly transversely striated.

*Eyes* large, oval and prominent, placed in a slight depression on each side of the head.

*Antennæ* multiarticulate, consisting apparently of about 150 joints, but, owing to the dense pubescence of the terminal articulations, only about 100 can be counted; the basal joints up to about the twenty-fourth smooth and without hairs, but from this point there is a very gradual increase in pubescence to the extremity: first joint large and cylindrical, covered sparsely with fine shallow impressions; second joint of about a third the length of the first, cylindrical and slightly depressed; third joint elongate-cylindrical and slightly rugulose, nearly twice the length of the second; remaining joints



A. *Anostostoma alatum*; B. Front of head; C. Mouth-organs from below; D. Forked ridge, with ocelli.

considerably shorter, but similar in character to the third, excepting in the pubescent clothing of most of them.

*Mandibles* powerful, incurved, cylindrical towards the base, depressed from the middle, with flattened cutting-edge armed with seven unequal teeth, the last of these being the acuminate extremity of the mandible: unlike the mandibles of *A. cuniculator*, they are perfectly symmetrical; their surface is distinctly uneven.

*Labrum* elongated, extending to the commencement of the cutting-edge of the mandibles; bottle-shaped, slightly flattened, transversely striated, with central longitudinal carina diverging in the middle to

enclose an unequally pentagonal impression; extremity (representing the globe of the bottle) depressed and scarcely perceptibly swollen in the dorsal line.

*Maxillæ* slender, elongated, incurved, very sparsely provided with hairs; outer lobe simple, rugulose, swollen at the extremity; inner lobe nearly smooth, compressed, with carinated inferior edge, its inner surface sulcated, extremity armed with three long spines, one of which is subterminal and the two others terminal.

*Maxillary palpi* six-jointed, the first two joints short, smooth and swollen; the others, excepting the terminal one, which is a mere button, elongated, smooth and cylindrical.

*Labium* elongated, depressed, curved, irregular in outline, swollen at the sides, its free margins crenulated; the ligula separated into apparently three-jointed pseudopalpi, the third or terminal joint of which is large and oval.

*Labial palpi* four-jointed, the terminal article being a mere button; the third joint longest, widening gradually from its base to its culmen; other joints compressed, the basal one being the shortest.

*Prothorax* smooth and constricted, with slightly elevated, rugose and marginally carinated borders, the inner edges of which are marked by depressed lines; slightly narrower in front than behind, with dorsal and transverse central impressed lines, the latter interrupted in the middle by two deep central punctures; a third similar puncture at the posterior extremity of the dorsal line, behind which the inner edge of the posterior border is represented by a widely divergent angular depression.

*Prosternum* slightly rugulose, simple.

*Abdomen* rather small, cylindrical, the cerci very hairy.

*Elytra* and *wings* shining, brown, with very prominent veins.

*Legs* moderately robust, very long and more slender than in the other species; coxæ and femora smooth; anterior femora unarmed; intermediate femora with carinated infero-exterior margin, armed in the middle with three equidistant, acute, but small denticles; posterior femora ornamented along the superior half of their exterior surface by an obliquely striated patch, carinated and longitudinally sulcated on their lower surface, the outer half of the carina being armed with four acute denticles; inferior surface of knee-joint also armed with an acute spur; anterior tibiæ with two superior terminal, one superior central, and ten inferior spines, the latter arranged in pairs and divergent; intermediate tibiæ strongly carinated above, with seven dorsal spines which diverge in pairs from near the top of the carina on either side; posterior tibiæ three-sided, the edges carinated, with nine spines on the supero-interior margin (the two terminal spines large and curved), and ten on the supero-exterior margin; inferior margin with two central and three terminal spines, the latter being the largest; tarsi short, broad, lobate below: length of legs—anterior pair 30 millimetres, intermediate pair 28, posterior pair 45.

Antananarivo (*Kingdon*). Type in Brit. Mus.

4. On new Birds collected by Mr. C. Buckley in Eastern Ecuador. By P. L. SCLATER, F.R.S., and O. SALVIN, F.R.S.

[Received March 2, 1880.]

(Plates XVI., XVII.)

Mr. Clarence Buckley has just returned from Ecuador, after four years' absence, and, besides several collections transmitted during his stay, has brought back with him one of the finest series of bird-skins which we have ever had the pleasure of looking through. The greater part of it was formed on the upper branches of the Rio Pastaza, and on the spurs lying between this stream and its affluent the Bobonaza, Mr. Buckley's headquarters having been during the greater part of the time the village of Sarayacu on the latter stream, which must be carefully distinguished from the place of the same name on the Ucayali. Mr. Buckley's collection consists of upward of 10,000 skins referable to nearly 800 species. Of these a complete set has been secured for the collection of Salvin and Godman. Besides the novelties which we proceed to describe, the collection contains examples of many rare and little-known species, such as *Cotinga porphyrolæma*, ScL. et Dev., *Chamaea nobilis*, Gould, *Phlogopsis erythroptera* (Gould), *Pipreola sclateri* (Corn.), *Osculatia sapphirina*, Bp., *Mitua salvini*, Reinh., *Accipiter pectoralis*, ScL., and *Leucopternis plumbea*, Salvin. At a later period we hope to be able to give a complete account of Mr. Buckley's collections in this district.

#### Fam. VIREONIDÆ.

##### 1. HYLOPHILUS FUSCICAPILLUS, sp. nov.

*Supra olivaceo-viridis, pileo toto cum cervice postica dorso superiore et scapularibus caféo-brunneis; alis nigris, extus olivaceo limbatis; subtus ex olivaceo-flavidus, medialiter clarior; gutture sordide albo; subalaribus et remigum marginibus internis albicanti-sulphureis; cauda olivacea-unicolore; rostro corneo, mandibula inferiore pallidiore; pedibus fuscis: long. tota 3·8, alæ 2·4, rem. primi spurii 1·4, caudæ 1·7, rostri 0·6.*

*Hab.* Sarayacu, Ecuador (Buckley).

*Mus.* S.-G. et P. L. S.

*Obs.* Affinis *H. semibrunneo*, sed capite magis fusco et ventre flavo distinguendus.

#### Fam. TANAGRIDÆ.

##### 2. NEMOSIA CHRYSOPIS, sp. nov.

*Cinerea; dorso superiore, alis extus et pileo toto flavicante lavatis; loris, capitis lateribus et gutture tota flavis, hoc colore in pectore et ventre dilutiore; alis intus et cauda fuscis; remigum marginibus interioribus albis; rostro corylino; pedibus plumbeis: long. tota 5·2, alæ 2·7, caudæ rotundatæ 2·2, tarsi 0·8.*

*Hab.* Sarayacu, Ecuador (Buckley).

*Mus.* S.-G.

*Obs.* Species affinis *N. ruficipiti* et *N. sordida*, sed colore uniformi insignis.

Mr. Buckley obtained but a single example of this *Nemosia*, which appears to be a very distinct species of the section *Thlypopsis*. The wings are rather short, the third and fourth primaries, which are equal and longest, slightly exceeding the second and fifth. The tail is rather rounded; the tail-feathers are slightly pointed at their extremities.

#### Fam. TYRANNIDÆ.

##### 3. PLATYRHYNCHUS SENEX, sp. nov.

*Brunnescenti-olivaceus, uropygii plumis et tectricum majorum marginibus rufescentibus; pileo nigricante, crista mediali semicelata alba; subtus saturate flavicanti-fulvus, gula alba; subalaribus ventre concoloribus; remigibus et rectricibus nigris brunnescenti-olivaceo extus limbatis; rostro superiore nigro, inferiore flavido; pedibus albis: long. tota 4, alæ 2·5, caudæ 1·3, rostri a rictu 0·7, tarsi 0·6.*

*Hab.* Sarayacu, Ecuador (*Buckley*).

*Mus.* S.-G.

*Obs.* Species *Pl. rostrato* proxima et ejusdem formæ, sed crassitie minore et pileo nigricante necnon ventre saturatiore distinguenda.

##### 4. SERPHOPHAGA ALBOGRISEA, sp. nov.

*Supra grisea, alis et cauda nigricantibus; macula celata verticali, tectricibus alarum et secundariis extus latissime albis; loris et corpore subtus albis, hypochondriis vix griseo tinctis; rostro et pedibus plumbeis: long. tota 4·2, alæ 2·6, caudæ 2·3, tarsi 0·75.*

*Hab.* Sarayacu, Ecuador (*Buckley*).

*Mus.* S.-G.

*Obs.* *S. cinereæ* affinis, sed pileo dorso concolori et alis latissime albo marginatis distinguenda.

The beak of the single specimen in Mr. Buckley's collection is unfortunately defective, but enough is left to show that the species belongs to the genus *Serphophaga*, its nearest ally being the bird with which we have compared it.

##### 5. SYRISTES ALBOCINEREUS, sp. nov.

*Tyrannus*, sp.?, *Scl. & Salv. P. Z. S.* 1865, p. 189.

*Syristes albogriseus*, *Scl. & Salv. P. Z. S.* 1873, p. 280 (nec Lawrence).

*Supra griseus; capitis lateribus alis et cauda fusco-nigricantibus, secundariis extus albo limbatis; capite summo nigerrimo; dorso postico, uropygio et corpore toto subtus albis; rostro et pedibus nigris: long. tota 7, alæ 3·9, caudæ 3·3, rostri a rictu 1·1, tarsi 0·9.*

*Hab.* Amazon. sup. (*Bartlett, Whitely*); Sarayacu, Ecuador (*Buckley*); Columbia (*Mus. P. L. S.*).

*Mus.* S.-G. et P. L. S.

*Obs.* *S. sibilatrix* et *S. albogriseo* affinis, ab illo uropygio albo ab hoc tectricum alarum marginibus albo haud marginatis diversus.

The receipt of specimens of the true *S. albogriseus* has shown us that we were wrong in attributing the Amazonian bird to that species, from which it is readily distinguishable by the almost entire absence of the broad white margins to the wing-coverts.

6. *MYIOCHANES NIGRESCENS*, sp. nov.

*Contopus*, sp. inc., Sclater, P. Z. S. 1858, p. 459.

*Myiochanes cinereus*, Scl. Cat. Am. B. p. 232 (ex. ♂).

*Unicolor cinereo-nigricans*, pileo, alis et cauda paulo saturatioribus; rostro superiore nigro, inferiore albicante; pedibus nigris: long. tota 4·4, alæ 2·2, caudæ 2·2.

*Hab.* Sarayacu, Ecuador (*Buckley*).

*Mus.* S.-G. et P. L. S.

*Obs.* Sp. *M. cinereo* affinis, et ejusdem formæ, sed colore nigricantiore distincta.

An imperfect example of this species has long been in Sclater's collection, obtained at Gualaquiza on the Rio Santiago, in 1858, by Mr. Fraser. The receipt of additional and perfect skins enables us now to characterize it as distinct from *M. cinereus*, to which Sclater referred it in his 'American Catalogue.'

Fam. PIPRIDÆ.

7. *HETEROCERCUS AURANTIIVERTEX*, sp. nov.

*Supra* olivaceus, alis caudaque nigris olivaceo limbatis; crista verticali elongata aurantio-rubra; subtus medialiter fulvus, lateraliter in olivaceum transeuns; gula et colli lateribus albis; capitis lateribus cinereis; subalaribus olivaceis, remigum et rectricum pagina inferiore cineraceo-nigra; rostro obscure corylino, pedibus fuscis: long. tota 4·5, alæ 3·4, caudæ rectr. ext. 1·0, med. 2·0, tarsi 0·6, rostri a rictu 0·7.

*Hab.* Sarayacu, Ecuador (*Buckley*).

*Mus.* S.-G. et P. L. S.

*Obs.* Species *H. flavivertici* proxima, sed cristâ aurantiacâ nec flavâ, et magis amplâ, necnon colore corporis inferiore sanè diversa.

Three examples of this apparently new *Heterocercus* are in the collection. Judging from its near ally, *H. flavivertex* of Pelzeln, of which two species are in Sclater's collection, they are all males, as in the females of the last-named species the coloured vertical crest is wanting.

The tail is of the same abnormal construction as in the two other species of this genus. The feathers are rather stiffened and curve outwards towards their extremities; the three outer pairs of rectrices are rapidly shortened and diminished in breadth, the outer pair only measuring about 1 inch from their insertion.



## Fam. COTINGIDÆ.

## 8. PTILOCHLORIS BUCKLEYI, sp. nov. (Plate XVI.)

*Supra olivacea, alis intus fuscis; subtus flavissima (subalaribus concoloribus) nigro distincte squamata; gula et ventre imo fere immaculatis; rostro nigricante corneo, mandibulæ basi albicante; pedibus obscure plumbeis: long. tota 8, alæ 4.1, caudæ 2.5, rostri a rictu 1, tarsi 1.*

*Hab.* Pindo, Ecuador (*Buckley*).

*Mus.* S.-G.

*Obs.* *P. squamata* ex Brasilia affinis, sed capite summo olivaceo nec nigro diversa.

Mr. Buckley obtained a single female example of this species together with two nestling birds. The latter are mostly in their first plumage, the quill-feathers being only partially developed. The plumage (see Plate XVI.) is most remarkable: the upper surface, including the whole of the head, is of a cinnamon colour spotted with black, each black spot on the head being tipped with white; the under surface is black, banded with narrow white bars. From the top of the head proceed fine black filaments more than an inch long, each tipped with white.

The tip of the fourth primary in the female bird is of the normal width. It would therefore seem probable that the narrow point to this feather observable in *P. remigialis* is only a characteristic of the male sex of *P. squamata*, in which case Lafresnaye's title will become a synonym of Prince Max. zu Wied's older name.

## Fam. DENDROCOLAPTIDÆ.

## 9. AUTOMOLUS DORSALIS, sp. nov.

*Supra pileo dorso toto et alis extus olivaceis rufo perfusis, plumis in fundo cinereis; superciliis elongatis ochraceis; uropygio et cauda tota castaneis; subtus ochraceus, medially clarior, lateraliter in colorem dorsi transeuns; gula fere albicante; subalaribus et remigum pogoniorum interonrum marginibus internis ochraceis; rostro superiore corylino, inferiore albo, pedibus pallide corylinis: long. tota 7, alæ 3.8, caudæ 3.2, rostri a rictu 1, tarsi 0.9: caudæ rectricibus acuminatis; alis rotundatis, remige quarto et quinto longissimis.*

*Hab.* Sarayacu, Ecuador (*Buckley*).

*Mus.* S.-G., specimen unicum.

*Obs.* Affinis *A. pallidigulari* et quoad colorem corporis inferi valde similis, sed dorso saturatè rufo diversus.

## Fam. FORMICARIIDÆ.

## 10. DYSITHAMNUS SUBPLUMBEUS, sp. nov.

*Dysithamnus plumbeus*, Scl. P. Z. S. 1858, p. 457, nec Max.

*Obscure plumbeus fere unicolor, subtus paulo dilutior; alis caudaque nigricantibus, illarum tectricibus omnibus maculis minutis albis terminatis; alarum pagina inferiore fusciscenti-cinerea; rostro*

*et pedibus nigris: long. tota 5.4, alæ 2.7, caudæ 2.1, rostri a rictu 0.9, tarsi 1.1.*

♀. *Mari similis, sed alis extus, dorso postico, lateribus et ventre toto rufescente brunneo, præcipue in corpore inferiore, perfusis; maculis tectricum pallide cinnamomeis.*

*Hab.* Sarayacu, Ecuador (*Buckley*); Zamora (*Fraser*); Yquitos, E. Peru (*Whitely*).

*Mus.* S.-G. et P. L. S.

*Obs.* Species *D. plumbeo* ex Brasilia affinis, sed rostro longiore, tectricum maculis rotundis et axillaribus alis concoloribus nec albis distinguenda.

#### 11. HERPSILOCHMUS FRATER, sp. nov.

*Supra olivaceus, pileo et striga utrinque postoculari nigris, superciliis et genis albis; alis nigris, remigum pogoniis externis extus castaneis; tectricibus omnibus et secundariis dorso proximis albo late marginatis; subtus pallide limonaceo-flavus; cauda nigra, rectricum lateraliū apicibus late albis; rostro superiore nigro, inferiore albicante; pedibus viridescenti-plumbeis: long tota 4.0, alæ 2.1, caudæ 1.7, rostri 0.7.*

♀. *Mari similis, sed pileo castaneo diversa.*

*Hab.* Sarayacu, Ecuador (*Buckley*).

*Obs.* Species *H. rufo-marginato* maximè affinis, sed interscapulio non nigro et remigum colore castaneo saturatiore satis diversa.

#### 12. MYRMOTHERULA SPODIONOTA, sp. nov.

*Supra cinerea; alis nigris brunnescente olivaceo extus limbatis; harum tectricibus omnibus nigris, maculis terminalibus albis ornatis; subtus dorso concolor, ventre imo hypochondriis et crisso in brunnescenti-olivaceum transeuntibus; gula nigra albo stellata; cauda brunnescenti-olivacea; rostro nigro, pedibus fuscis: long. tota 3.5, alæ 2.1, caudæ 1.4, rostri a rictu 0.7.*

*Hab.* Sarayacu, Ecuador (*Buckley*).

*Mus.* S.-G., specimen unicum!

*Obs.* Species affinis *M. gulari* et *M. fulviventri* et ejusdem formæ sed dorso cinereo dignoscenda.

#### 13. TERNURA HUMERALIS, sp. nov.

*Supra olivacea; pileo summo et nucha nigris; loris, capitis lateribus et corpore subtus cinereis, abdomine olivaceo lavato; dorso et campteriis late castaneis; alis nigricantibus, tectricum apicibus flavis, plumis omnibus olivaceo marginatis; rostri maxilla nigra, mandibula albicante; pedibus plumbeis: long. tota 3.6, alæ 2, caudæ 1.5, rostri a rictu 0.6, tarsi 0.6.*

♀. *Mari similis, sed pileo nigro et humeris castaneis carens.*

*Hab.* Sarayacu, Ecuador (*Buckley*).

*Mus.* S.-G.

*Obs.* *T. callinotæ*, Scl., similis, sed campteriis castaneis nec flavis facile distinguenda.

14. *HYPOCNEMIS STELLATA*, sp. nov.

*Supra castaneo-brunnea, plaga dorsali celata alba; dorso postico nigro, fascia transversa cinnamomea notata; alis nigris, remigibus extus castaneis, tectricibus omnibus cinnamomeo terminatis fascias duas alares formantibus; subtus alba, pectore maculis sparsis nigris notato; rostro corneo, mandibula albicante, pedibus pallide corylinis: long. tota 3.8, alæ 2.4, caudæ 1.2, rostri a rictu 0.8, tarsi 0.9.*

*Hab.* Sarayacu, Ecuador (*Buckley*).

*Mus.* S.-G.

This species belongs to the group containing *H. theresæ*, from which it is at once distinguishable by its long narrow bill, and by the paucity of the round black spots on the breast.

15. *HYPOCNEMIS LEPIDONOTA*, sp. nov.

*Schistacea, dorsi plumis nigris albo marginatis; alis nigris, secundariorum et tectricum apicibus albo late terminatis; cauda nigra maculis magnis albis medialiter notata; rostro et pedibus nigris.*  
♀. *Pallide badia, capite et collo postico saturatioribus, dorso et alis sicut in mari pictis.*

*Long. tota 4.2, alæ 2.6, caudæ 1.6, rostri a rictu 0.75, tarsi 0.9.*

*Hab.* Sarayacu, Ecuador (*Buckley*); Upper Amazons (*Hauzwell*).

*Mus.* S.-G. et P. L. S.

*Obs.* *H. pœcilonotæ* similis, sed colore corporis inferi in mari dilutior, in feminâ badio nec schistaceo facile distinguenda.

16. *PITHYS MELANOSTICTA*, sp. nov.

*Brunnea, supra paulo rufescentior; dorsi medii tectricum alarum et secundariorum plumis nigro subterminatis et castaneo terminatis; remigibus extus castaneis; pileo medio sordide albicante; oculorum ambitu nudo; capitis lateribus et loris nigris; rostri maxilla cornea, mandibula albicante, pedibus pallide plumbeis: long. tota 5.2, alæ 3, caudæ 1.8, rostri a rictu 0.9, tarsi 1.1.*

*Hab.* Sarayacu, Ecuador.

*Mus.* S.-G.

This is a very distinct species, having somewhat the appearance of *Phlogopsis*, but possessing a short tail as in the genus *Pithys*.

17. *GRALLARIA DIGNISSIMA*, sp. nov. (Plate XVII.)

*Supra olivacea, interscapulio fulvescente; alis extus in castaneum transeuntibus; dorso postico nigro, plumarum scapis albo lineolatis; subtus medialiter alba, gutture et pectore summo clare rubris, lateribus valde plumosis, olivaceis, albo et nigro flammulatis; cauda brevissima, tectricibus fere abscondita, obscure olivacea; subalaribus gutture concoloribus; remigum marginibus internis fulvis; rostro forti, crasso, corneo; mandibula inferiore albicante; pedibus olivaceis: long. tota 6, alæ 4.1, caudæ 1.1, rostri a rictu 1.3, tarsi 2.2.*

*Hab.* Sarayacu, Ecuador (*Buckley*).

*Mus.* S.-G. et P. L. S.

*Obs.* Species quoad colores ad *G. ruficapillam* appropinquans, sed gutture rubro, flammulis laterum latis et distinctis et rostro crasso notabilis.

Of this fine new and most distinct Ant-Thrush, Mr. Buckley obtained two specimens. According to Selater's arrangement of the genus (Ibis, 1877, p. 437), it should perhaps come next to *G. ruficapilla*, but it has a particularly large strong bill like that of *G. squamigera*, only shorter. The bright ferruginous red breast and strong white flammulations render this species quite unmistakable.

Fam. PICIDÆ.

18. *CELEUS SPECTABILIS*, sp. nov.

♀. *Capite cristato toto cum gula et alis extus castaneis, harum tectricibus et scapularibus cum dorso superiore nigro et fulvo transfasciatis; dorso postico fulvo immaculato; pectore nigro; ventre fulvo, præcipue in parte superiore nigro maculato; cauda tota et remigum primariorum apicibus nigris; horum pagina inferiore ad basin castanea; subalaribus fulvis, maculis paucis nigris notatis; rostro albedo; pedibus pallide fuscis: long. tota 9·2, alæ 6, caudæ 4, rostri a rictu 1·4.*

*Hab.* Sarayacu, Ecuador (Buckley).

*Mus.* S.-G.

*Obs.* Affinis *C. torquato* et *C. tinnunculo*, sed ab hoc uropygio fulvo ab illo dorso fasciato distinctus.

There is unfortunately only one example of this fine and distinct *Celeus* in Mr. Buckley's collection. The male would, no doubt, show a red cheek-patch, as in the allied species.

Fam. RALLIDÆ.

19. *PORZANA CENOPS*, sp. nov.

*Supra olivaceo-fusca, dorso postico et cauda nigricante brunneo indutis; fronte, capitis cervicis et pectoris lateribus rubro-castaneis; subtus gastræo toto albo, hypochondriis nigro late transfasciatis; crisso rufo; rostro viridescente fusco; pedibus corylinis: long. tota 5·7, alæ 3·2, caudæ 1·5, rostri a rictu 0·9, tarsi 1·4, dig. med. cum ungue 1·7.*

*Hab.* Sarayacu, Ecuador (Buckley).

*Mus.* S.-G.

*Obs.* *P. albigulari*, Lawr., affinis, sed collo postico et dorso antice olivaceo-fuscis nec rufescentibus, et gastræo toto medio albo dignoscenda.

5. On the Sea-birds obtained during the Voyage of Lord Lindsay's Yacht 'Venus' from Plymouth to Mauritius in 1874. By HOWARD SAUNDERS, F.L.S., F.Z.S., &c.

[Received March 2, 1880.]

A short time ago Dr. Ralph Copeland, of the Dunecht Observatory, Aberdeen, offered to obtain for my inspection a collection of

Sea-birds procured by Lord Lindsay's party during the voyage to Mauritius to observe the Transit of Venus; and as he also informed me that an accurate register had been kept of the date and the latitude and longitude of each capture, I gladly accepted the task of identifying the species and preparing a list of them. The collection proved to consist of eighteen species, most of them belonging to the Procellariidæ; but of these several are uncommon and little-known forms. Others are more familiar species; but no specimens can well be considered superfluous in assisting to determine the validity of some of the reputed species in this difficult group, which has lately been taken up by Mr. Osbert Salvin, to whom I am in several cases indebted for valuable assistance.

Unusual care appears to have been taken in forming this collection, each specimen being numbered and entered under a corresponding number in a register kept by Dr. J. Galley Blackley, with particulars of date, latitude and longitude of the ship at noon, temperature of the air and of the water, &c. Dr. Copeland's journal has also supplied some other particulars, which I have quoted *verbatim*. The above details are of considerable value, as they furnish a record of the degrees of latitude where these oceanic species are first met with; and if similar registers were kept by other ships, and the specimens obtained were brought back for identification, we should in time arrive at some definite knowledge of the range of these pelagic wanderers. Allusions to the occurrence of the first Albatros, "Mollymawk," "Cape Hen," "Cape Pigeon," &c. are, indeed, not wanting in voyages; but there are few records similar to the present in which registration has been followed by identification in the case of so large a number of species.

The 'Venus' left Plymouth in October 1874, and the first species on the list was obtained off Trinidad (not to be confounded with our large West-Indian possession), a small island about six miles in circumference, situated in the South Atlantic Ocean in lat.  $20^{\circ} 23'$  S., and long.  $29^{\circ} 43'$  W. This rugged rock, with precipitous cliffs, scanty and irregular water supply, and deficient in timber beyond mere brushwood, was originally taken possession of for Great Britain by Captain E. Halley, of the 'Paramore' (afterwards Dr. Halley, Astronomer Royal), in 1700, and in 1781 was occupied for about two months; since which the most important visits have been those of the French corvette 'La Coquille' in 1822, when the island was surveyed, and that of the Italian corvette 'Magenta' in 1868, when two species of Petrel were obtained and described as new. Dr. E. H. Giglioli then recorded for the first time the occurrence in that island of the beautiful snow-white and highly specialized form of Tern *Gygis candida*, of which there is one specimen in the present collection. I gather from the scanty material at my disposal that some of Lord Lindsay's party landed on this island, which is difficult of access owing to its being surrounded by coral reef, although the island itself belongs to the same formation as the coast about Rio Janeiro; and the paucity of notes on the species observed is therefore the more to be regretted. To make

matters worse, most of the birds collected there were thrown overboard as lumbering the decks in some heavy weather on the night after the visit; and it is perhaps owing to this that no examples are in the collection of *Æstrelata arminjoniana* and *Æ. trinitatis* obtained by the 'Magenta's' naturalists.

1. *FREGATA AQUILA* (Linn.) Frigate-bird.

Two specimens, nos. 22 and 23, both females in immature plumage, passing into the adult stage. As this plumage is rarely met with and is little known, it is as well to describe it. The wings, back, and tail are black, with a bar of old brown light-edged feathers along the upper wing-coverts; belly white; flanks and under wing-coverts black; shoulders rusty black passing into chestnut, which pervades the throat; neck, nape, and crown of head white slightly tinged with rust; bill horn-white.

"Off island of Trinidad, South Atlantic, Aug. 20, lat. 20° 23' S., long. 29° 43' W. Temperature of air 77° Fahr. and of water 71°. Large numbers seen; some deep black with scarlet pouch under the throat. Found them sitting on the island."

2. *SULA PISCATOR* (Linn.).

No. 24, fully adult. Island of Trinidad, same date as above. "These also were sitting."

3. *PHALACROCORAX CAPENSIS* (Sparrm.).

No. 76, female immature. Simons Bay, Cape of Good Hope, Oct. 2.

No. 76a, adult. Same time and place.

4. *PHAETHON FLAVIROSTRIS*, Brandt.

No. 100, female, nearly adult. "Shot hovering round masts," Oct. 29, lat. 23° S., long. 59° 18' W.

5. *GYGIS CANDIDA* (Gm.).

No. 28, female. Island of Trinidad, Aug. 21. "Breeding. Iris black." There is a fine illustration of this beautiful species in Gould's 'Birds of Australia,' vii. pl. 30.

6. *STERNA MACRURA*, Naum. Arctic Tern.

No. 95, male. Oct. 23, lat. 32° S., long. 57° 18' E. "Flew on board in the night, commencement of S.E. monsoon."

This specimen is an adult with full black head, excepting on the forehead, where the feathers are white, as usual in autumn. It belongs certainly to this species, which I have also had on one occasion from the Cape of Good Hope; but this is yet more south and east for its range. It might have been expected that *S. virgata* or *S. vittata*, both inhabitants of the islands of the Southern Ocean, would have

been obtained, but they are not noticed, nor are they known to occur in Table Bay.

7. *FREGETTA MELANOASTRA* (Gould).

*Thalassidroma melanogastra*, Gould, B. Austr. vii. pl. 62.

Nos. 86, 88, males. Oct. 15, lat.  $36^{\circ} 57'$  S., long.  $40^{\circ} 41'$  E.

No. 91, female. Oct. 19, lat.  $32^{\circ} 36'$  S., long.  $52^{\circ} 58'$  E.

8. *OCEANITES OCEANICUS* (Kuhl). Wilson's Petrel.

*Thalassidroma wilsonii*, Gould, B. Austr. vii. pl. 65.

No. 64. Sept. 22, lat.  $35^{\circ} 29'$  S., long.  $9^{\circ} 46'$  E.

No. 90. Oct. 19, lat.  $32^{\circ} 36'$ , long.  $52^{\circ} 58'$  E. Female.

Both these specimens have the vent and under tail-coverts *black*, and not white, as coloured in Gould's 'Birds of Australia.'

9. *ADAMASTOR CINEREUS* (Gm.). "Whale-bird."

*Procellaria hastata*, Gould, B. Austr. vii. pl. 47.

Nos. 60 (female), 61, 62. Sept. 21, lat.  $35^{\circ} 20'$  S., long.  $9^{\circ} 43'$  E.

In one specimen the black and yellow colours of the bill are more strongly marked than in the other two.

10. *MAJAEQUEUS AEQUINOCTIALIS* (Linn.).

*Procellaria conspicillata*, Gould, B. Austr. vii. pl. 46.

No. 56. Sept. 19, lat.  $34^{\circ} 39'$  S., long.  $8^{\circ} 51'$  E.

No. 93. Oct. 20, lat.  $32^{\circ}$  S.

No. 97, male. Oct. 24, lat.  $29^{\circ} 45'$  S.

The variations in these specimens are rather peculiar. In all the prevailing colour is sooty black; but in the first there is a white patch of about  $\frac{1}{4}$  inch in length under lower mandible, and an irregular white streak on the left side, below the line of the gape, but none on the right side; the second has rather more white on throat; and in the third, the white extends as far back as a line from the eyes.

11. *CESTRELATA MOLLIS* (Gould).

*Procellaria mollis*, Gould, B. Austr. vii. pl. 50.

No. 41. Island of Trinidad, Aug. 21. "Knocked down with a stick on island."

12. *CESTRELATA PHILIPPI*, G. R. Gray.

No. 80. Oct. 10, lat.  $37^{\circ} 59'$  S., long.  $29^{\circ} 18'$  E.

13. *DAPTION CAPENSIS* (Linn.). "Cape Pigeon."

*Daption capensis*, Gould, B. Austr. vii. pl. 53.

Nos. 46, 46a, 48. Aug. 27 onwards, the first being observed on Aug. 26, in lat.  $23^{\circ} 30'$  S.; temperature of air  $65^{\circ}$ , water  $67^{\circ}$ . "Sept. 19, many thousands of these and 'Ice-birds' flying round; they seemed to extend in undiminished numbers to the horizon."

14. *OSSIFRAGA GIGANTEA* (Gm.). "Cape Hen."*Procellaria gigantea*, Gould, B. Austr. vii. pl. 45.

No. 50, male. Sept. 10, lat.  $34^{\circ}$  S., long.  $10^{\circ} 42'$  W. "Beak pale apple-green, much darker at tip; iris dark brown; feet sooty black."

No. 52. Sept. 14. "Beak greyish green, darker at tip; iris dark brown; feet silvery brown. Spread of wing 6 feet 7 inches."

Both these specimens are much darker than the figure in Gould's pl. xlv. 'Birds of Australia.'

15. *PRION DESOLATUS* (Gm.). "Ice-bird."Nos. 57, 58, male. Sept. 21, lat.  $35^{\circ} 20'$  S., long.  $9^{\circ} 43'$  E.No. 89. Oct. 15, lat.  $36^{\circ} 57'$  S., long.  $40^{\circ} 41'$  E.

The two former have a distinct yellowish nail at the tip of the upper mandible; the last has a slightly narrower bill—differences which, if admitted as specific, appear to be the distinguishing characteristics of *P. vittatus* and *P. desolatus*.

16. *DIOMEDEA CHLORORHYNCHA*, Lath. "Mollymawk."*Diomedea chlororhynchos*, Gould, B. Austr. vii. pl. 42.No. 51, female. Sept. 14, lat.  $34^{\circ} 25'$  S.

No. 96, male. Oct. 24, lat.  $29^{\circ} 45'$  S., long.  $57^{\circ} 39'$  E.; temperature of both air and water  $67^{\circ}$ . Mr. Gould met with it on the 24th July, 1838, in lat.  $30^{\circ} 38'$  S.

17. *DIOMEDEA EXULANS*, Linn.*Diomedea exulans*, Gould, B. Austr. vii. pl. 38.

Nos. 53, male, and 55, female. Sept. 16, lat.  $34^{\circ}$  S., long.  $4^{\circ} 29'$  E. "The male is an adult, nearly white; spread of wings 10 feet 3 inches, nett weight 19 lb. Contained 10 lb. of water and cuttle; but the water was probably swallowed whilst being hauled on board. Feet 9 inches broad when spread out. Female, total weight about 15 lb. Iris dark brown, beak pink, feet bluish."

No. 85. Oct. 12, lat.  $39^{\circ} 40'$  S., long.  $32^{\circ} 19'$  E. Young, much mottled with grey.

Mr. Gould records its occurrence same date as above.

18. *DIOMEDEA FULIGINOSA*, Gm.*Diomedea fuliginosa*, Gould, B. Austr. vii. pl. 44.No. 79, male. Oct. 10, lat.  $37^{\circ} 59'$  S., long.  $29^{\circ} 18'$  E.

Mr. Gould notes its first occurrence in July, in one of his voyages, in lat.  $31^{\circ}$  S.



6. Descriptions of new Species of Phytophagous Coleoptera.  
By MARTIN JACOBY.

[Received February 18, 1880.]

(Plate XVIII.)

Genus MASTOSTETHUS, Lac.

1. MASTOSTETHUS CHONTALENSIS, sp. nov.

Oblong, parallel. Testaceous; base of head, a transverse fascia on the thorax, and two transverse bands on the elytra, one at the base, the other behind the middle, black; sides of the breast, a streak at the upperside of the femora, and the tibiæ black.

Length  $4\frac{1}{2}$  lines.

*Hab.* Chontales, Nicaragua.

Base of head closely punctured near the eyes; lower part of face testaceous, very shining, deeply transversely grooved; apex of jaws black; antennæ light testaceous, the first three joints black, closely pubescent. Thorax transverse, subquadrate, angles distinct, sides slightly contracted near the base and apex; surface widely, but distinctly punctured, the entire disk occupied by a transverse black band of rather irregular shape, thickened at each end. Scutellum black, distinctly punctured. Elytra irregularly and deeply punctured; the base is occupied by a rather large black transverse band which does not quite touch the lateral margins, and is narrowed towards the scutellum; while another broader band is placed behind the middle, the anterior margin of which is slightly sinuate. Underside testaceous; sides of breast, upper surface of the femora, and the tibiæ black.

This species is closely allied to *M. vicinus*, Lac., but differs in several particulars as regards coloration, the principal difference consisting in the want of the black extremity of the elytra.

Collected by Mr. Belt. In the collection of Messrs. Godman and Salvin.

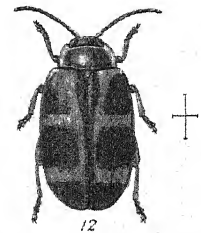
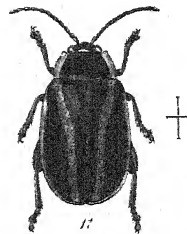
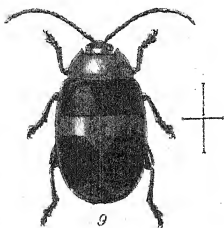
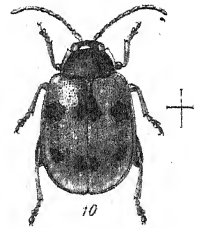
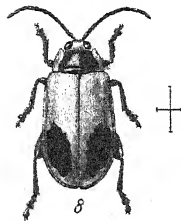
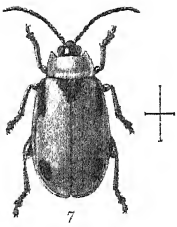
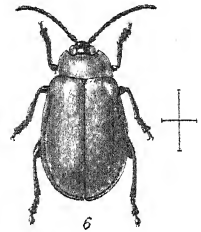
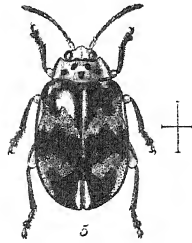
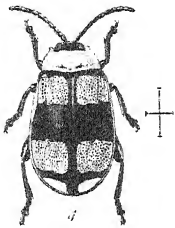
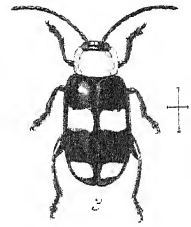
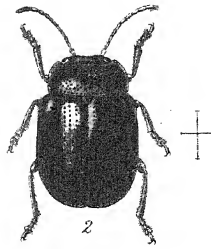
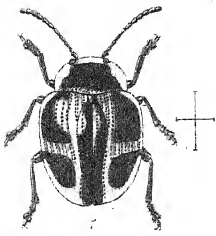
2. MASTOSTETHUS ROGERSI, sp. nov.

Oblong. Dark rufous; antennæ black; elytra testaceous, closely punctured, a spot at the base and a broad band behind the middle black.

Length 4 lines.

*Hab.* Cache, Costa Rica.

Head with some spots on the vertex, closely punctured round the eyes, with a short longitudinal fovea in the middle, entirely dark rufous; antennæ black, the first four joints shining, the rest closely pubescent. Thorax wider at the base than the apex; the angles rather blunt; surface with a few distinct punctures. Scutellum rufous, its apex black. Elytra wider at the base than the thorax, deeply and irregularly punctured, testaceous; the base of





each elytron is occupied by a large roundish black spot narrowed near the scutellum, and leaving the shoulders of the ground-colour, while another black broad band is placed near the extremity; the posterior margin of this band is bilobed, while its anterior margin is perfectly straight. Underside dark rufous; the breast and the four anterior tibiæ black; posterior tibiæ testaceous; posterior femora with a distinct tooth.

Collected by Mr. Rogers. Collection of Godman and Salvin.

### Genus LAMPROSOMA, Kirby.

#### 3. LAMPROSOMA IGNICOLLE, sp. nov.

Ovate, subrotundate. Bright metallic green; above violaceous blue; thorax and apex of elytra bright golden-coloured.

Length  $2\frac{3}{4}$  lines.

*Hab.* Brit. Honduras.

Head rather convex, distinctly punctured; antennæ black, the basal joint metallic green. Thorax transversely convex; lateral margins straight, the sides greatly deflexed; posterior margin regularly concave at each side, greatly produced in the middle; surface closely and distinctly punctured. Elytra not wider than the thorax, narrowed towards the apex; each elytron with ten rows of very deep punctures, violaceous blue, the last third and the apex ornamented with a bright golden spot. Underside and legs bright metallic green. Prosternum large, rounded posteriorly, distinctly punctured.

Collections of Godman and Salvin and Jacoby.

#### 4. LAMPROSOMA VIOLACEUM, sp. nov.

Ovate-rotundate, convex. Dark violaceous blue; the anterior legs, tibiæ, tarsi, and abdomen black; head minutely, thorax distinctly punctured; each elytron with ten rows of deep punctures.

Length  $2\frac{1}{2}$  lines.

*Hab.* Brit. Honduras (*Blancaneau*).

Head almost flat, with an indistinct median depression, extremely minutely granulose and punctate; labrum black; antennæ black, second and third joint fulvous. Thorax of usual shape; its sides perfectly straight; surface distinctly punctured, the punctures becoming deeper near the base. Scutellum black. Elytra not wider at the base than the thorax, narrowed and rounded posteriorly; each elytron with ten rows of deep punctures, which become rather finer towards the apex; lateral lobes angulate. Prosternum black, slightly longer than broad, impressed with some distinct punctures.

Closely allied to *L. cyaneum*, Lac., but differing in the want of the anterior depression at the head; the latter is at the same time impunctate and very finely granulate; the thorax is much less strongly punctured than in *L. cyaneum*, and its lateral margins are straight instead of rounded.

Collection of Godman and Salvin.

5. *LAMPROSOMA GUATEMALENSE*, sp. nov.

Oblong-ovate, narrowed behind, convex. Black; above violaceous blue; head, sides, and anterior margin of thorax and a broad band at the extremity of the elytra cupreo-aureous.

Length  $1\frac{1}{2}$  line.

*Hab.* Zapote, Guatemala.

Head obsoletely impressed in the middle, not closely, but distinctly punctate; labrum black. Sides of the thorax greatly deflexed, the lateral margins slightly rounded, anterior angles very acute; surface closely punctured, but not more deeply than the head; the sides and anterior margins are occupied by a broad cupreo-aureous band, leaving only the middle of the base and a protruding point at the middle of the ground-colour. Elytra regularly convex and narrowed behind, rather deeply punctate-striate, dark violaceous blue; a broad band of the same colour as that of the thorax is placed at the last third near the lateral margin, and extends across the suture to the other side, covering at the same time the extremity of the elytra. Underside and legs black.

This species is closely allied to *L. scintillans*, Lac., and others described by the same author, from all of which it differs, however, in the shape of the band of the thorax as well as that of the elytra and the distinct punctation of the head.

Collected by Mr. Champion. Collection of Godman and Salvin.

6. *LAMPROSOMA POLITUM*, sp. nov.

Oblong-ovate, convex, narrowed behind. Metallic green; tarsi and antennæ (the second and third joints of the latter excepted) black; head distinctly, thorax minutely, punctate; elytra narrowed behind, with ten rows of deep punctures, the interstices minutely punctate.

Length  $2\frac{1}{2}$  lines.

*Hab.* Brit. Honduras (*Blancaneau*).

Head slightly convex, very distinctly punctured; eyes broadly emarginate; labrum black. Thorax transversely convex, its sides straight; the anterior margin not produced in the middle, regularly concave at each side; posteriorly acutely produced in the middle, the sides regularly crescent-shaped; surface scarcely punctured. Scutellum black. Elytra regularly convex, slightly narrowed posteriorly, the lateral lobes acutely, but moderately, produced; each elytron with ten rows of very deep punctures, the last two outer rows of which are much closer approached than the others; the interstices also finely punctate. Prosternum slightly longer than broad, distinctly, but not closely, punctured.

This species resembles much *L. speciosum*, Lac., from Brazil; but it is narrower, less convex; the thorax is much finer punctured, and the interstices of the striæ on the elytra are also minutely punctate; and as the locality is also far removed, it is no doubt a good species.

Collection of Godman and Salvin.

## Genus EURYOPE, Dalm.

## 7. EURYOPE BATESI, sp. nov.

Oblong, moderately convex. Shining rufo-castaneous above; below, the antennæ and legs black; thorax and elytra finely punctured.

Length  $4\frac{1}{2}$ –6 lines.

*Hab.* Nguru Mountains, East Central Africa.

Lower part of head rather deeply but widely, upper part finely punctured; face impressed on either side with a more or less distinct oblique fovea; anterior margin of the clypeus and the mandibulæ black; antennæ robust, the last six joints broadly dilated, entirely black. Thorax convex, twice as broad as long; sides nearly straight, anterior angles produced into a pointed tooth; surface closely and finely punctured, impressed on either side by a deep transverse groove. Scutellum black, smooth. Elytra wider than the thorax, subquadrate oblong, deeply transversely depressed below the basilar space, more or less distinctly costate near the lateral margins and on the disk, punctured like the thorax, the punctation diminishing towards the apex.

In the specimens which I take to be the females the costæ on the elytra are strongly developed and extend to about half their length. This species differs from *E. nigripes*, Thoms., in the black underside and the antennæ, these differences distinguishing it also from *E. sanguinea*, Oliv.

Collection of Jacoby.

## 8. EURYOPE MINUTA, sp. nov.

Oblong-subquadrate. Æneous, greenish black below; underside of first joint of the antennæ and the entire second joint, together with the femora (base and apex excepted), rufous.

Length  $2\frac{1}{4}$  lines.

*Hab.* Cape of Good Hope.

Head moderately convex, extremely finely granulate, covered with close and distinct punctuation; apex of jaws and a spot at the base of the vertex fulvous. Thorax very convex and rather narrow, the sides greatly deflexed, lateral margins rounded and widened in the middle, anterior angles acute, but not produced, surface minutely granulate and punctured like the head. Elytra short, regularly rounded towards the apex, distinctly depressed below the basilar space, granulate like the rest of the surface, but more finely punctured than either head or thorax. Underside greenish black, deeply punctate, the middle of each femora bright rufous.

One specimen in my collection.

## Genus STILODES, Chev.

## 9. STILODES CHAPUISI, sp. nov.

Oblong-ovate. Fulvous; elytra testaceous, geminate punctate-striate, each elytron with four interrupted narrow longitudinal black vittæ.

Length 4 lines.

*Hab.* Chontales, Nicaragua.

Head finely punctured; labrum testaceous; antennæ extending slightly further than the base of the thorax, their last seven joints black. Thorax more than three times as broad as long, widened in the middle, the anterior margin nearly straight; surface irregularly and deeply but not closely punctate, the sides scarcely closer punctured than the disk. Scutellum impunctate. Elytra convex, nearly four times as long as the thorax, geminate punctate-striate, the punctures, however, not regularly placed and often interrupted, the interstices also very minutely punctured; each elytron with four black narrow stripes, the first running parallel to the suture, often obsolete and broken, the second and third from the base are abbreviated near the apex, the fourth near the lateral margin extending nearly to the end of the elytron. Underside fulvous; tibiæ and tarsi lighter; claws piceous.

Collected by Mr. Belt.

This species, although greatly resembling *S. fuscolineata* of Stål, is distinguished from the latter in not having the suture dark like the elytral stripes, and the puncturing not regularly arranged as in that species. In *S. fuscolineata* the punctured striæ limit exactly the black elytral stripes and are deeply impressed, while in the present species the puncturing does not run regularly in pairs, and is often wider than the vittæ, being besides that sometimes quite broken and finer.

Collections of Godman and Salvin and Jacoby.

10. *STILODES STEINHEILI*, sp. nov. (Plate XVIII. fig. 1.)

Broadly ovate, moderately convex. Black; head and sides of the thorax light testaceous, with a metallic greenish gloss; elytra regularly punctate-striate, flavous, the sutural and lateral margins and two large patches, one before, the other behind the middle of each elytron, metallic violaceous blue.

Length 4 lines.

*Hab.* Columbia.

Head flat, impunctate, separated from the clypeus by a distinctly angulated transverse groove; lower part of face, a narrow median line running upwards to the base and sides of the latter, dark brown; rest of the surface light testaceous with an iridescent gloss; antennæ extending to a little beyond the base of the elytra, black, basal joint testaceous beneath, the third joint as long as the first two united, the apical joints gradually widened. Thorax three times as broad as long; its sides straight at the base, rounded from the middle to the apex; posterior margin widened towards the middle; surface distantly but distinctly punctured, sides impunctate and coloured like the base of the head, forming a broad band, the posterior portion of which is greatly narrowed and sharply limiting the rest of the black surface. Scutellum oblong, black. Elytra comparatively flat, regularly striate-punctate; each elytron with ten rows of punctures, the first short; interstices smooth, flavous or testaceous, with the sutural and lateral margins violaceous blue, the former being wide at the base and gradually narrowed posteriorly; a large patch

of the same colour and of triangular shape is placed between the fifth and ninth stria, nearly extending to the middle of the disk; another patch, of a little smaller size and connected by a point with the lateral margin, is situated directly behind the middle. Underside and legs black.

One specimen in my collection.

### Genus *PLAGIODERA*, Redt.

#### 11. *PLAGIODERA* *QUADRIMACULATA*, sp. nov.

Oblong-ovate. Black; thorax distinctly punctate at the sides, finely on the disk; elytra strongly and closely punctate, each elytron with a narrow oblique short transverse band before the middle and a large irregularly shaped spot near the apex sanguineous.

Length  $4\frac{1}{2}$  lines.

*Hab.* R. Susio, Costa Rica.

Head with a distinct longitudinal middle line, finely punctate at the sides, more strongly towards the middle; clypeus separated by a triangular groove; antennæ a little longer than the base of the thorax, black, the first four joints slender, the rest transverse and gradually widened. Thorax very narrow, about  $3\frac{1}{2}$  times broader than long; anterior margin strongly concave, posterior one but slightly produced at the base; sides narrowed from base to apex; anterior and posterior angles obtuse; surface much more distinctly punctured at the sides than at the disk. Scutellum impunctate. Elytra subparallel, rather deeply foveolate below each humeral callus, the fovea joined by a short indistinct groove running upwards to the base, the latter also transversely depressed; disk closely and strongly punctured except near the base, where the punctation is greatly diminished; an oblique sinuate transverse band of light red colour is placed below the base and extends nearly to the suture, while another rather more lighter-coloured spot of triangular shape occupies the space below the middle, but without touching the suture or the extremity of the elytra. Underside and legs black; last abdominal segments margined with testaceous.

Collected by Mr. Rogers.

Messrs. Godman and Salvin's collection.

### Genus *AUSTRALICA*, Chevrol.

#### 12. *AUSTRALICA* *VIOLACEA*, sp. nov. (Plate XVIII. fig. 2.)

Oblong, convex. Greenish æneous below; antennæ and tarsi fulvous; above shining violaceous blue; elytra deeply punctate-striate.

Length 3 lines.

*Hab.* New Guinea.

Head very deeply and closely punctate in front, more sparingly and finer at the vertex, with a fine longitudinal groove in the middle; labrum and palpi fulvous; antennæ incrassated near the apex, fulvous. Thorax nearly three times as broad as long; the lateral margins



straight at the base, rounded in front; anterior margin deeply concave, posterior one strongly convex; disk distantly, sides very closely and deeply punctured, especially near the anterior angles. Scutellum metallic green or brass-coloured. Elytra convex, with a deep fovea at the lateral margin below the humeral callus, and a more shallow transverse depression surrounding the fovea; surface of each elytron with ten regular rows of deep punctures, the first of which extends to only one third the length of the elytra; these punctures diminish in depth near the apex, and partly unite at the same place; interstices perfectly smooth. Legs fulvous, with a greenish æneous hue.

Collected by Mr. D'Albertis. Three specimens in my collection.

Family HALTICINÆ.

Genus HOMOPHÆTA, Erichs.

13. HOMOPHÆTA MILITARIS, sp. nov.

Elongate, widened behind, convex. Black; head and upper parts yellowish white, more or less stained with bright rufous; elytra impunctate, shining, each elytron with a large spot at the base and another below the middle black.

Length 4 lines.

*Hab.* Zapote, Guatemala.

Head longer than broad, rather flat, with a few distinct punctures across the middle and round the inner orbits of the eyes, yellowish white; the encarpæ and the parts of the mouth as well as the palpi piceous; antennæ black, all the joints, with the exception of the second, which is short, slender, and of nearly equal length. Sides of the thorax nearly straight; the anterior angles slightly thickened and reaching to the middle of the eyes, but not produced in shape of a tooth; surface impunctate. Scutellum smooth. Elytra a little wider at the base than the thorax, distinctly widened posteriorly, the humeral callus but slightly depressed within; surface impunctate or very finely punctured, only visible under a strong glass; a large round spot at the base and another more transversely shaped near the apex of each elytron of a black or dark violaceous colour, the ground-colour being either entirely yellowish white or changing into bright rufous along the sutural and lateral margins, the former having this colour generally widened in the middle and at the apex. Underside and legs black, closely but finely covered with yellowish hairs.

Collections of Godman and Salvin and Jacoby. Collected by Mr. Champion.

This handsome species is almost identical in coloration with the *Lactica macula*, Fabr., from which it may be at once distinguished by the want of the thoracic transverse depression peculiar to all the species of the genus *Lactica*. In those specimens which are marked with the rufous colour the latter generally predominates at the thorax as well, so as to leave only the anterior angles of a lighter shade.

The genus *Homophæta* (formerly spelt *Omophoita*) may be at

first sight recognized by the white frontal patch of the head, which is peculiar to all the species at present known. Von Harold has pointed out recently the other distinguishing characters, as the elongate metatarsus, the little-developed encarpæ, and the *not* tooth-like produced anterior angles of the thorax.

14. *HOMOPHÆTA AFFINIS*, sp. nov.

Elongate, subparallel. Black beneath; above yellowish white, more or less intermixed with rufous; a spot before and another below the middle dark brown.

Length 4-4½ lines.

*Hab.* Capetillo, Dueñas, Guatemala.

As this species resembles in most respects *H. militaris*, it will be sufficient to point out the differences only.

The antennæ in the present species are more robust, the joints less elongate and filiform; the thorax has the anterior angles greatly thickened, and the sides are much more distinctly margined than in *H. militaris*; the elytra are more convex in the latter species as well as dilated, while in the present insect they are more parallel. The spots on the same parts are also differently placed and of different shape, the basal spot of *H. militaris* having its place in *H. affinis* before the middle and nearer the suture, at the same time being obliquely shaped and, as well as the posterior one, of a brown instead of a black colour. The rufous colour is more visible near the base and lateral margins, not extending so much near the suture as in *militaris*. In other respects there is no difference between the two insects.

Collections of Godman and Salvin and Jacoby.

15. *HOMOPHÆTA BITENIATUS*, sp. nov. (Plate XVIII. fig. 3.)

Elongate, parallel. Flavous; breast, legs, and antennæ black; above shining purplish or bluish black; thorax and two transverse bands on the elytra yellowish white.

Length 3½ lines.

*Hab.* Cayenne, Bolivia.

Head black, with the usual light frontal patch and the clypeus of the same colour, sparingly punctate near the eyes; labrum and palpi flavous, the former with a few long white hairs; antennæ as long as half the body, with the third joint the longest; basal joint flavous beneath. Thorax three times as broad as long; sides nearly straight at the base, rounded towards the apex; lateral margins greatly thickened at the anterior angles, the latter produced to nearly the extent of the eyes; anterior and posterior margins straight; surface impunctate. Scutellum black. Elytra parallel, not visibly punctured, of a splendid dark purplish or bluish colour, with a very regularly-shaped transverse band in the middle, and another narrower one, slightly curved, near the apex, light flavous. Breast and legs (base of the latter being sometimes flavous) black; abdomen flavous.

Collection of Jacoby.

This species may be distinguished from *H. albofasciatus*, Jacoby, by the different shape of the transverse elytral bands, which in *H. albofasciatus* are distinctly curved, by its narrower shape and smaller size, and the greater length of the antennæ, and the long third joint of the latter. The thorax also is differently built, and the anterior angles much more advanced.

Genus *ÆDIONYCHIS*, Latreille.

16. *ÆDIONYCHIS QUINQUEVITTATA*, sp. nov.

Broadly ovate, convex. Below black, above light fulvous; head antennæ, the suture, and two narrow longitudinal stripes on each elytron (one on the disk, the other near the lateral margin) black.

Length 3 lines.

*Hab.* British Honduras.

Head with a few deep punctures round the inner orbit of the eyes; encarpæ fulvous, but slightly elevated, separated from the head by a transverse groove; carina distinctly raised and sharp; anterior margin of labrum and the palpi fulvous; antennæ black, apex of the first three joints fulvous, fourth and fifth joints the longest, of equal length. Thorax transverse, sides rounded and rather broadly flattened; anterior angles slightly produced outwards; surface impunctate, fulvous, irregularly spotted with piceous. Scutellum black. Elytra a little widened behind the middle, convex at their posterior half, closely and distinctly punctate, light fulvous; the suture, a narrow stripe at the disk abbreviated near the apex, and another one near the extreme lateral margin, joined at the apex with the sutural one, black; inflexed limb of the elytra fulvous outwardly, black inwardly. Underside and legs black, strongly punctured; the outer margins of the abdominal segments and the underside of the tarsi fulvous.

Collected by Mons. Blancaneau. Collections of Godman and Salvin and Jacoby.

17. *ÆDIONYCHIS ORNATA*, sp. nov.

Broadly ovate, convex. Fulvous; a longitudinal spot at the base of the head; the anterior legs and antennæ black; elytra testaceous, the suture, lateral margin, and a longitudinal stripe abbreviated at the apex, on the disk of each elytron, deep black.

Length 3 lines.

*Hab.* Capetillo, Guatemala.

Head with a few punctures near the eyes, fulvous; encarpæ slightly raised, piceous; carina indistinct; base of head with a short longitudinal black stripe; antennæ with the third and fourth joints of equal length, the rest robust. Thorax of nearly equal width, sides broadly flattened, anterior angles obtuse; disk minutely punctured, with seven rather indistinct piceous spots (3. 4). Scutellum black. Elytra convex, closely and strongly punctured, pale testaceous; a narrow sutural and lateral stripe joined at the apex, and another between the two, interrupted at a little distance from the

apex, black; inflexed limb of the elytra black; the two anterior pair of legs of the same colour. Underside and posterior legs fulvous.

Sufficiently distinguished from *quinquevittata* by the colour of the underside and the position of the lateral elytral stripe, which covers the lateral margin instead of running parallel to it, as in the former species.

Collections of Godman and Salvin and my own.

18. *ÆDIONYCHIS CRUCIGERA*, sp. nov. (Plate XVIII. fig. 4.)

Ovate, convex. Piceous below, above yellowish white; a broad transverse band across the middle, a narrow one near the apex and another at the extreme base of the elytra as well as the suture narrowly purplish metallic.

Length 4 lines.

*Hab.* Brazil.

Head distinctly foveolate between the eyes, black; inner orbit of the eyes fulvous; three basal and the apical joint of the antennæ obscure fulvous. Anterior angles of thorax slightly produced into a short rounded tooth; sides straight at the base, rounded towards the apex; surface impunctate. Scutellum black. Elytra convex, nearly parallel, closely and finely punctured; the median transverse band straight and broad, connected narrowly by the suture with another very narrow band near the apex, and a still narrower one at the extreme base, none of these bands touching the lateral margins. Underside and legs piceous, stained here and there with dark brown.

A specimen which I take for a variety has the posterior band enlarged into a triangular patch, which occupies the entire apex, and extends upwards along the lateral margin.

In my collection.

19. *ÆDIONYCHIS VARIEGATA*, sp. nov. (Plate XVIII. fig. 5.)

*Æ. clavicornis*, Clark, MS.

Broadly ovate, convex. Fulvous or dark brown below; above light fulvous or flavous; four apical joints of the antennæ, lateral margins and five spots of the thorax, and two or three broad, irregularly-shaped, transverse bands of the elytra black.

Length  $3\frac{1}{2}$ –4 lines.

*Hab.* Brazil.

Head minutely granulate; encarpæ not distinct; carina triangular, widened anteriorly; antennæ short, the apical joints transverse, broader than long, fourth joint the longest. Thorax more than three times as broad as long; posterior margin distinctly sinuate; sides round, flattened, their anterior angles much thickened, but not produced; surface minutely granulate, like the head, and covered with very small punctures, flavous; three small spots in the middle of the disk near the base, and two above them, as well as the extreme lateral margins, black. Scutellum flavous. Elytra widened in the middle, pointed at the apex; surface granulate and punctured, like the thorax; a broad, transverse, basal band, widened posteriorly at the suture, and having attached to it at each side a round spot, black; another bidentate broad band occupies the middle, and

is connected with a larger or smaller irregularly-shaped elongate apical spot near the suture, which in some specimens is almost obsolete; besides these bands two small black spots are placed near the lateral margins, one at the shoulder and the other immediately below it. Upper surface of the femora and tibiæ marked with a black line.

This rather peculiarly-shaped species may be easily recognized by the short antennæ, the apical joints of which are distinctly transverse. In my collection.

20. *EDIONYCHIS DUODECIM-MACULATA*, sp. nov.

Subelongate-ovate. Dark brown below base of head and antennæ, black; thorax bright fulvous; elytra dark bluish black, each elytron with six pale yellow spots (1, 2, 2, 1).

Length 3 lines.

*Hab.* Capetillo, Guatemala.

Head as long as broad, impunctate; clypeus fulvous or testaceous; antennæ nearly as long as half the body, the middle joints slightly dilated, first joint robust, thick and short, second joint half the length, moniliform, third joint but little longer, the terminal joint the longest. Sides of thorax round, the anterior angles scarcely visibly produced, but acute; surface impunctate, rather convex. Elytra very distinctly and closely punctured, black with a bluish or violaceous tint, shining; two spots at the base, four transversely placed in the middle, four others below the middle, and two at the extreme apex light flavous. Underside and femora fulvous, tibiæ piceous.

In Messrs. Godman and Salvin's collection and my own. Collected by Mr. Champion.

21. *EDIONYCHIS OBSCURIPENNIS*, sp. nov. (Plate XVIII. fig. 6.)

Broadly ovate, widened behind, convex. Black; above obscure light brown; elytra distinctly punctate.

Length  $3\frac{1}{2}$ – $4\frac{1}{2}$  lines.

*Hab.* Chanchamayo, Peru.

Head smooth, impunctate, longitudinally grooved; encarpæ and carina broad, the latter short; antennæ extending to nearly half the length of the elytra; first joint robust, widened at the apex, third joint twice as long as the second, fourth the longest, the three basal joints shining, the rest pubescent, black. Thorax narrowly transverse, anterior and posterior margins straight, sides broadly flattened, the lateral margins much rounded towards the apex; anterior angles thickened, acute, but scarcely produced into a tooth; surface scarcely visibly punctate. Scutellum black. Elytra greatly widened and convex posteriorly, distinctly margined; the surface closely covered with distinct punctures, light brown, intermixed with lighter roundish spots, giving the surface a rather mottled appearance. Underside, with the exception of the thorax, and legs entirely black, shining and sparingly pubescent.

Three specimens in my collection.

22. *ÆDIONYCHIS QUINQUEMACULATA*, sp. nov. (Plate XVIII. fig. 7.)

Elongate, widened behind. Black; clypeus, thorax, and elytra fulvous, the latter with five elongate black spots (3, 2).

Length 4 lines.

*Hab.* Chanchamayo, Peru.

Head longer than broad, attenuate, black, impunctate; encarpæ and carina rather flattened; clypeus fulvous or testaceous; antennæ filiform, basal joint slender, second rather longer than usual, third and fourth joints subequal, black, the base of the first three joints obscure fulvous. Thorax about two and a half times as broad as long, sides flattened, lateral margins moderately rounded, anterior angles produced into rather long acute teeth; surface entirely impunctate. Scutellum black. Elytra obsoletely impressed below the base, widened posteriorly, very finely punctate, in some specimens almost disappearing, fulvous; an elongate short streak at the humeral callus, a triangular spot surrounding the scutellum, and two other elongate sublateral spots near the apex black. Underside and legs black.

In my collection.

23. *ÆDIONYCHIS BINOTATA*, sp. nov. (Plate XVIII. fig. 8.)

Elongate. Black below; above yellowish grey; antennæ, disk of the thorax, and two large patches near the apex of the elytra black.

Length 3 lines.

*Hab.* Amazons.

Base of head swollen, impunctate, a spot behind each eye black; antennæ long, filiform, first three joints pale testaceous below, the rest black, second joint short, the others very nearly equal in length. Thorax convex at the disk, sides depressed and flattened, anterior angles thickened but not produced; surface smooth, impunctate, black, the sides yellowish grey. Scutellum fuscous. Elytra elongate, parallel, moderately convex, very finely and closely punctured, of a pale yellowish grey; each elytron with an elongate large black patch below the middle, not touching the margins nor the apex. Underside and legs black.

Type in my collection.

24. *ÆDIONYCHIS TREDECIM-MACULATA*, sp. nov.

Ovate, dilated posteriorly. Fulvous; antennæ, first four joints excepted, black; elytra fulvous, with thirteen black round spots (3, 4, 4, 2).

Length  $2\frac{1}{2}$  lines.

*Hab.* Mexico.

Head rather flattened, impunctate; antennæ as long as half the body, third and fourth joints of equal length, four basal joints fulvous shining, the rest black, pubescent. Thorax with the posterior margin rounded and produced in the middle, the sides rounded and flattened, and the anterior angles acute, but scarcely produced; surface impunctate, fulvous, stained with piceous. Scutellum black. Elytra closely punctate, the interstices subrugose,

with the spots placed as follows:—one at each shoulder close to the base, one surrounding the scutellum, four transversely placed before, four others in a semicircle behind the middle, and two near the apex close to the lateral margins. Underside fulvous, breast piceous.

Two specimens in my collection.

25. *ÆDIONYCHIS NIGRICOLLIS*, sp. nov. (Plate XVIII. fig. 10.)

Ovate, convex. Piceous below; tibiæ and antennæ fulvous; head and thorax black, rugose punctate; elytra fulvous, three transversely placed spots before and four smaller ones behind the middle, black.

Length  $2\frac{3}{4}$  lines.

*Hab.* —?

Head longer than broad, deeply punctured at the vertex; lower part of face and the antennæ fulvous; third joint of the latter longer than the fourth, the rest thickened gradually. Thorax comparatively long, anterior angles produced into a short tooth, sides flattened; surface closely rugose-punctate and finely granulate, black, with a greenish hue, the extreme lateral margins flavous. Scutellum black. Elytra convex, deeply and closely punctate, light fulvous or flavous, with part of the extreme base and the first third of the sutural margin (the latter widened behind into a round spot) black; besides these marks each elytron has three other spots—one transverse-shaped before the middle, between the lateral margin and the sutural spot, and two behind the middle obliquely placed and of smaller size, of which the inner one is placed close to the sutural margin. Underside piceous; inner edge of the posterior femora and the tibiæ and tarsi fulvous.

Two specimens in my collection.

26. *ÆDIONYCHIS GODMANI*, sp. nov.

Broadly ovate. Dark brown; antennæ obscure piceous, first three joints flavous; above flavous; elytra finely punctate, a basal transverse band and a large patch behind the middle on each elytron dark brown.

Length  $3\frac{1}{2}$ –4 lines.

*Hab.* Costa Rica and Chontales (Nicaragua).

Head with a fine longitudinal groove at the vertex, the latter impunctate dark brown; lower part of face flavous; encarpæ but little raised; carina short, swollen; antennæ reaching to one third the length of the body, first joint much thickened, of almost equal size, second joint one third shorter than the third, the rest pubescent. Sides of thorax much rounded, anterior angles thickened and produced in shape of a short tooth; surface impunctate, flavous. Elytra closely punctate, the punctuation diminishing towards the apex, flavous, the base being occupied by a broad dark brown band which does not touch the lateral margins, while a large round patch of the same colour is situated behind the middle, leaving the lateral margin and apex of the ground-colour. Entire underside and legs dark brown.

Collected by Mr. H. Belt and Mr. Rogers.

Types in Messrs. Godman and Salvin's collection and my own.

27. *ÆDIONYCHIS SALVINI*, sp. nov.

Broadly ovate. Dark brown below, above flavous testaceous; antennæ and base of head black; elytra closely and rather deeply punctate, flavous; a subquadrate sutural spot surrounding the scutellum, a narrow streak at the shoulders, and two short transverse bands behind the middle bluish black.

Length 4 lines.

*Hab.* Zapote, Guatemala, and Costa Rica.

Head with a few deep punctures at the vertex, the latter black; lower part of face flavous, stained more or less with piceous; antennæ black, the first joint slender, stained with fulvous below. Thorax rather convex, the sides straight at the extreme base, from there to the apex rounded; the anterior angles much thickened and strongly produced outwards; surface finely but distinctly punctured. Elytra convex, subparallel, strongly and closely punctured, flavous, spotted with black; the sutural spot is broadest at the base, its sides deeply concave; the apex nearly straight; the shoulder-spots consist of a short narrow streak, while the transverse postmedian bands do not quite touch the sutural nor lateral margins, the apical spot being rather round. Entire underside and legs ferruginous.

*Var.* The basal spot of broad and round shape, separated at the apex, the shoulder-spot wanting, and the transverse bands united into a large round spot. This variety I also possess from Costa Rica.

Collected by Mr. Champion.

Types in Messrs. Godman and Salvin's collection and my own.

28. *ÆDIONYCHIS STEINHEILI*, sp. nov. (Plate XVIII. fig. 9.)

Broadly ovate. Piceous, above fulvous; elytra distinctly punctured, a broad transverse band at the base and a large patch below the middle dark violaceous blue.

Length 5 lines.

*Hab.* Columbia.

Head very minutely punctured; encarpæ and carina rather flattened and broad; antennæ long, filiform, third joint double the length of the second and half the length of the fourth joint, piceous. Thorax transversely convex, sides broadly flattened and slightly excavated; lateral margins very round, narrowed from base to apex; posterior margin straight; anterior angles produced into rather large teeth of square shape; surface closely but scarcely more strongly punctured than the head. Scutellum fulvous. Elytra wider at the base than the thorax, much widened towards the middle, distinctly margined, closely and a little more strongly punctured than the head, the dark blue bands not touching the lateral margins. Underside and legs piceous, abdomen fulvous.

At once distinguished from *Æ. bifasciata*, Baly, by its large size, the dark underside and antennæ.

Two specimens in my collection.



29. *EDIONYCHIS ABBREVIATA*, sp. nov.

Broadly ovate. Fulvous; elytra distinctly punctured, fulvous or flavous, a broad transverse basal band and two others behind the middle, none of them touching the lateral margins, violaceous blue.

*Var.* The posterior bands united into a large patch.

Length  $3\frac{3}{4}$ –4 lines.

*Hab.* Amazons.

Head with a few distinct punctures at the vertex and a deep fovea in the middle; antennæ entirely fulvous or piceous, with the first three joints fulvous. Thorax about three times as broad as long, its sides broadly flattened, anterior angles produced into a blunt tooth, surface minutely punctured; scutellum fulvous. Elytra closely punctate, longitudinally impressed within the humeral callus; surface rather convex, with three violaceous blue bands across the disk, the two posterior ones of which are closely approached and narrower than the basal one. Underside and legs fulvous.

This species seems closely allied to *bifasciata*, Baly; but the antennæ and apex of the posterior femora are described as black, and only two elytral bands are mentioned. It may, however, turn out to be a variety of Baly's species.

Three specimens in my collection.

30. *EDIONYCHIS MARGINICOLLIS*, sp. nov. (Plate XVIII. fig. 11.)

Oblong-ovate, convex. Black below (tarsi excepted), above violaceous blue; sides of the thorax and a narrow sutural and marginal vitta of the elytra, united at the base and apex, flavous.

Length 3 lines.

*Hab.* Rio Janeiro.

Head deeply punctured at the vertex, about as broad as long; eyes prominent; antennæ black, the two basal and the apical joints fulvous. Thorax comparatively broad, sides flattened and evenly rounded; anterior angles acute, but not produced into a tooth; surface impunctate, black, lateral margins flavous. Elytra convex, widened behind the middle, strongly punctured at the base, less so towards the apex; each elytron with a curved, narrow, longitudinal vitta near the suture and the lateral margin flavous; the sutural vitta forms a continued line with the flavous thoracic margin, and unites at the base and the apex with the lateral band, the space between the two bands being widest in the middle of the elytra; epipleuræ of the latter also flavous. Underside and legs black; extreme apex of the tibiæ and the tarsi fulvous.

Type in my collection.

At first sight this species seems closely allied to *cosmogramica*, Harold; but the punctuation of the elytra and the coloration of the legs and antennæ distinguish it.

31. *EDIONYCHIS SEX-PLAGIATA*, sp. nov. (Plate XVIII. fig. 12.)

Oblong-ovate. Fulvous; above flavous; disk of thorax, the suture, and three transverse bands on each elytron fulvous.

Length  $3\frac{3}{4}$  lines.

*Hab. Amazons.*

Head as broad as long, deeply punctate near the inner orbit of the eyes, and longitudinally grooved in the middle; antennæ entirely fulvous, third joint not much longer than the second, apical joints gradually thickened and subquadrate. Sides of thorax flattened and deeply depressed, with a distinct fold running parallel to the lateral margins; anterior angles much thickened, but scarcely produced; surface finely punctate, fulvous, the extreme lateral margins as far as the depressed portion flavous. Elytra widened behind the middle, closely and more strongly punctured than the thorax, flavous; a triangular patch below the base, a transverse broad band immediately below the middle, and another triangular-shaped patch near the apex, together with the suture, fulvous; the colour of the latter widens considerably towards the base and surrounds the scutellum; none of the above patches touch the lateral or sutural margins. Underside and legs fulvous.

Three specimens in my collection.

32. *ÆDIONYCHIS LATICOLLIS*, sp. nov.

Oblong-ovate. Piceous below, above ferruginous or fulvous; disk of thorax, a square broad patch at the base of each elytron and another below the middle black.

Length 3 lines.

*Hab.* Dueñas, Guatemala, and Columbia.

Head longer than broad, with the usual transverse groove between the eyes and a few deep punctures at the base; antennæ robust, the third joint double the length of the second, black. Thorax about twice as broad as long, comparatively broad, its sides broadly flattened and rounded; the anterior angles not produced into a tooth, but thickened and reaching to the middle of the eyes; posterior margin perfectly straight; surface very minutely punctured when seen under a strong lens, ferruginous; the entire disk occupied by a transverse black band. Scutellum piceous. Elytra very convex, rather broadly margined, punctured like the thorax; a large, square black patch is placed at the base and extends to the middle, and another one, the posterior margin of which is rounded, is situated immediately below the middle; neither of these marks extends to the sutural or lateral margins, and the space between them is very narrow. In the specimen from Guatemala the entire head is black, and the space on the disk of the elytra which divides the two patches is stained with flavous near the suture; but in all other respects the insect resembles completely the Columbian form.

Types in Messrs. Godman and Salvin's collection and my own.

*Note on a formerly described Species.*

*METAXYONYCHA RUFOLIMBATA*, Proc. Zool. Soc. 1878, p. 987.

This species has been erroneously described by me under the above generic name; it is identical with *Colaspis cruentata*, Lefèv.

## EXPLANATION OF PLATE XVIII.

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| Fig. 1. <i>Stilodes steinheili</i> , p. 170. | Fig. 8. <i>Edionychis binotata</i> , p. 177. |
| 2. <i>Australica violacea</i> , p. 171.      | 9. — <i>steinheili</i> , p. 179.             |
| 3. <i>Homophæta biteniatus</i> , p. 173.     | 10. — <i>nigricollis</i> , p. 178.           |
| 4. <i>Edionychis crucigera</i> , p. 175.     | 11. — <i>marginicollis</i> , p. 180.         |
| 5. — <i>variegata</i> , p. 175.              | 12. — <i>sexplagiata</i> , p. 180.           |
| 6. — <i>obscuripennis</i> , p. 176.          |  |
| 7. — <i>quinquemaculata</i> , p. 177.        |  |

7. Description of a new Snake of the Genus *Plectrurus* from Malabar. By Col. R. A. BEDDOME, C.M.Z.S.

[Received February 21, 1880.]

*PLECTRURUS AUREUS*, n. sp.

Snout obtusely conical; head-shield as in the genus, the supra-orbital about half as large as the postoculars; no temporals. Scales in 15 rows; ventrals 165, twice as broad as the adjoining scales; subcaudals twelve pairs; scales of the tail keeled; the horny terminal scale with two double points one above the other. Length 14 inches, of which the tail is about 1 inch. Of a brilliant yellow colour, brighter beneath, the scales edged with violet; with or without a few irregular narrow violet-black cross bars along the back; the belly much ornamented with broad violet-black cross bars, sometimes somewhat confluent; tail beneath with a long triangular violet-black blotch. The brilliant golden colour fades rapidly in spirit, as the yellow colour in these Uropeles always does, often turning the spirit quite yellow.

Two examples of this snake were captured on the Chambrá mountain in Wynad, near Kalpatty—one under an old rotten log at 6000 feet elevation, the other under a large stone at 4500 feet, both in heavy evergreen forest. The species is one of the most beautiful of the tribe.

8. Descriptions of five new Species of Rhopalocera from East Africa. By F. D. GODMAN and W. L. DISTANT.

[Received March 1, 1880.]

(Plate XIX.)

A short time ago Mr. Bates kindly gave Mr. Salvin and myself a small collection of Butterflies to select from, made by Mr. J. T. Last in the Gnuru Hills, opposite Zanzibar. It contained principally the common species which are widely distributed throughout the east coast; but amongst them were several specimens of a fine new *Danaïs*, and a single example of a *Phycæneura*, which I think ought to be described. To these descriptions I have added that of an *Acraea* procured by Mr. Jesse in Abyssinia in 1868, which has

remained in our collection ever since unnamed. Mr. Distant has taken this opportunity of describing two more novelties from the same quarter from Mr. Horniman's collection.

*DANAIS FORMOSA*, Godm., n. sp. (Plate XIX. fig. 1.)

Exp. 4 in.

Brownish black: basal half of primaries rufous; a subquadrate whitish spot near the end of the cell, a large irregular one below it, divided unequally by the second branch of the median nervure; three small spots below this, and three transverse ones beyond the cell, a fourth in a line with these nearer the outer margin; two sub-apical and a submarginal row of smaller spots: secondaries with basal half whitish, divided by dark nervures; two whitish spots beyond the cell, above which is a dull rufous patch and a double irregular line of submarginal white spots: below as above, but colours paler.

*Hab.* Gnuru Hills, East Africa (*Last*).

*Mus.* G. & S.

Resembles *Danais petiverana*, but may be easily distinguished from that species by having the primaries more elongate and the basal half rufous; the basal streak within the cell and the two spots below the first section of the median nervure are wanting; the basal half also of the secondaries is whitish, divided by blackish nervures. *D. petiverana* appears to be identical with *D. leonora* of Butler, and is closely allied to *C. limniace* of Cramer, and of which species it is the African form. As Mr. Butler has pointed out, it differs from *C. limniace* in having no white streak below the submedian nervure, and in the markings generally being broader. All our specimens of *D. petiverana* are from the west coast, whereas the present species is from the Gnuru Mountains in the interior, opposite Zanzibar.

*PHYSCÆNEURA PIONE*, Godm., n. sp. (Plate XIX. figs. 2, 3.)

Exp. 1·8 in.

Costa and exterior margin of both wings brown; two parallel fine submarginal white lines near the outer margin of both wings, within which is a row of five rufous ocelli with faint black pupils; a broad brown streak on the inner margin of primaries; interior area of both wings milky white, showing the markings of the underside. Beneath whitish, both wings crossed by transverse wavy blackish lines united at many points; a whitish interval on the discal area, beyond which is an ochreous band marked with a row of five silvery spots in the primaries and six in the secondaries; there is also a round ochreous spot with silvery pupil on the costa at the end of the cell, and three fine submarginal parallel black lines in both wings.

*Hab.* Gnuru Hills, East Africa (*Last*).

*Mus.* G. & S.

Closely allied to *P. panda* of Boisduval, but may readily be distinguished from that species by its having the interior area of both wings milky white instead of brown; it differs also in other particulars already pointed out.

*ACRÆA CHILO*, Godm., n. sp. (Plate XIX. figs. 4, 5.)

♂. Exp. 2·7 in.

Brick-red: costa and outer margin of primaries black, the latter marked with seven red spots; three black spots within the cell—one at the end, one in the middle, and the third towards the base; a transverse line of three confluent black spots beyond the cell, three immediately below the median nervure, and one towards the anal angle; secondaries blackish at the base, with exterior margin black, faintly spotted with red, seven or eight black spots on the inner area. Beneath as above, but paler; secondaries pinkish white, marked throughout with scattered black spots; exterior margin black, strongly marked with a row of white spots.

♀. Larger and paler; primaries diaphanous.

*Hab.* Kalamet, Sebka valley, Abyssinia (*Jesse*).*Mus.* G. & S.

Two specimens only of this species have come under our notice, a male and female, brought by Mr. Jesse from Abyssinia in 1868, and these have remained unnamed in our collection ever since. It does not appear to have any very close allies.

*ACRÆA INSIGNIS*, Distant, n. sp. (Plate XIX. fig. 6.)

♂. Upper wings above with rather more than basal half reddish orange, remaining apical portion and costa smoky hyaline, with the nervures darker; the basal reddish portion extends to end of cell, where there is a small black spot, and is then slightly curved to posterior angle; the inner margin is faintly black, and there is a small linear basal streak of the same colour.

Lower wings above reddish orange, with the hind margin narrowly black, and two somewhat large black spots in the cell, one at base and the other at apex; a spot of the same size and colour between second and third median nervules, immediately adjoining median nervure, from which the space to abdominal margin and median nervure is also almost completely suffused with black. In a second specimen these spots are all fused into one irregular large black basal patch.

Underside.—Upper wings as above, but the reddish basal portion very much paler. Lower wings pale ochreous, with a red sub-marginal band adjoining the black marginal border; black spots as above, but rather larger and more fused, with a few small basal ochreous spots near abdominal margin.

♀. Resembles ♂; fore wing with spot at end of cell larger, and hind wings with the black spots somewhat smaller and more segregated.

Exp. wings  $2\frac{2}{10}$  inches.*Hab.* Magila, East Africa.

This species belongs to the section of the genus represented by *A. horta*, Linn., to which it is allied; but it differs in the less number of spots in both wings, and in the much larger size and arrangement of those in the lower one; the posterior marginal border to the lower wing is also continuous and not macular as in *A. horta*.

This is almost certainly the species described by Mr. Hewitson

(Ent. Mo. Mag. vol. xiv. p. 155, 1877) as *A. burtoni*. The name had, however, been previously used by Mr. Butler (Ann. & Mag. Nat. Hist. (4) vol. xvi. p. 395, 1875). This probably having reached Hewitson's knowledge subsequently, induced that author to suppress his species, for it does not appear in Mr. Kirby's catalogue of his collection, its place only being indicated by a record of four undetermined specimens from Zanzibar. We have examined these; they are without any specific label or indication, but are clearly referable to the species here described.

*PRECIS ACTIA*, Distant, n. sp. (Plate XIX. fig. 7.)

♀. Above allied to the West-African form of *P. amestris*, but apex of fore wing and apical angle of lower wing more produced and pointed. The colour above is much paler; the six submarginal spots are all red, and have not the upper two white as in *P. amestris*; the lower three of these spots are inwardly margined with three black spots with very obscure white pupils, and are fused in the discal transverse bluish-green fascia; the three upper ones are preceded by three white spots, of which the first is very indistinct. Lower wing with the red spots more regular and fused into a regularly curved fascia, inwardly margined by a row of six black spots also regularly arranged.

Underside dull ochreous; both wings crossed by a transverse fuscous line, somewhat paler outwardly, curved at costa of fore wings, but becoming straighter at upper subcostal nervule, and carried regularly across lower wing to anal angle, where it is slightly curved; a faint waved submarginal line; two of the white sub-apical spots are visible below, and the black spots of the upper surface are also obscurely discernible.

♀. Exp. wings  $2\frac{1}{10}$  inches.

*Hab.* Masassi, East Africa.

Besides the above-mentioned differences on the upperside, the uniform ochreous colour of the underside and the absence of mottled markings thereon are sufficient to separate this species from *Precis amestris*.

#### EXPLANATION OF PLATE XIX.

- Fig. 1. *Danaïa formosa*, p. 183.
2. *Phycæneura pione*, p. 183.
3. ———, under side.
4. *Acræa chilo* ♂, p. 184.
5. ——— ♀.
6. ——— *insignis*, p. 184.
7. *Precis actia*, p. 185.

March 16, 1880.

Dr. A. Günther, F.R.S., Vice-President, in the Chair.

The Secretary made the following report on the additions to the Society's Menagerie during February 1880:—

The total number of registered additions to the Society's Menagerie during the month of February was 102, of which 14 were by birth, 37 by presentation, 42 by purchase, and 9 on deposit. The total number of departures during the same period, by death and removal, was 75.

The most noticeable additions during the month were:—

1. Two female Thars (*Capra jemlaica*), mother and young, presented by H.R.H. the Prince of Wales on the 5th February, 1880. The mother is the same animal that was brought home by the Prince of Wales on his return from India in 1876, and was deposited for some time in the Society's Gardens<sup>1</sup>. The young female was born whilst the mother was in the Society's Gardens. The male, which arrived at the same time, is unfortunately dead; so that another male of this species would be a very desirable acquisition to the Society's Menagerie.

2. Two Burrhel Wild Sheep (*Ovis burrhel*), purchased February 19th, being the first examples of this fine Himalayan Sheep that have been acquired by the Society.

Mr. W. K. Parker exhibited the eggs and embryos of some Crocodiles (*Crocodilus palustris*) obtained in Ceylon by Dr. W. R. Kynsey, Principal Medical Officer of Colombo, and kindly placed at Mr. Parker's disposal for embryological investigations by Sir Joseph Fayrer, F.Z.S. Mr. Parker read the following notes on the breeding of this Crocodile by S. Waytialingam, the native Assistant at the Civil Hospital, who had formed the collection:—

"13th September, 1879.

"I have been giving my close attention for the last two months to the eggs of Crocodiles. I find they commence to lay eggs in the months of June, July, and August, particularly in the former two months. They do not lay in muddy places, but always select sandy soil. They go far from the embankments of the tanks or pools in which they live in search of such suitable soils; and I have seen places where they have laid eggs at distances of from a quarter to half a mile from their water-places, where they live in holes made for themselves for the time being.

"They always try, if possible, to secure a part of the jungle unfrequented either by men or cattle.

"They make, first, a large hole for themselves to live in during the day in order to watch their eggs, and then make a small hole near and sometimes at the very mouth of the previous one, and lay the

<sup>1</sup> See P. Z. S. 1876, p. 464.

eggs in layers, one over the other, very nicely arranged in a circular form. They throw a very thin and loose covering of sand over them to the depth of about 12 or 13 inches, and then make a small heap of sand over the place.

"Very much like the Iguanas, Crocodiles also seem to lay all their eggs (between twenty and thirty in number) at the same time, and never disturb the nest until the hatching-time is finished, which lasts nearly ten weeks.

"They generally watch the eggs during the day, remaining in the hole made for themselves, and go at night in search of food. On cloudy and rainy days they are frequently seen upon the eggs, perhaps to warm them, but at other times move about the place or remain in the hole.

"All these actions are performed by the females; the males are never seen about the nesting-place.

"They do not allow anybody to go near the eggs; they make a fearful roaring noise, and attempt to attack people who go near. They keep a very strict watch, and very seldom or never quit the place during the day; but the wild Jackal (a sagacious brute) watches them carefully, and sometimes gets at the eggs in the absence of the mother.

"It is very difficult to find out the spot where the eggs are laid by Crocodiles, although they usually lay near the hole in which they live.

"The mother, who watches the place where the eggs are laid, never interferes with the nest, but carefully and attentively waits until the young are hatched, and then takes them into her large hole and under her protection, where they remain under her care for some time."

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Mr. Edward R. Alston exhibited a coloured drawing of an adolescent specimen of *Tapirus dowi* in the Paris Museum, for which he was indebted to the kindness of Prof. A. Milne-Edwards. This individual, which was of an almost uniform dark-brown colour, had been obtained by Mr. Carmiol on the Atlantic coast of Costa Rica, thus negating Mr. Alston's former suggestion that Dow's Tapir might prove to be confined to the Pacific slopes of Central America<sup>1</sup>. The British Museum has lately received a skeleton of *T. bairdi* from the same district, proving that the two forms are found together, at least in some localities.

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Mr. Alston also exhibited a specimen of a remarkable and little-known Australian Marsupial, *Antechinomys lanigera* (Gd.), belonging to the Museum of the University of Cambridge, remarking that Mr. Gould's original illustration<sup>2</sup> was so misleading, and Mr. Krefft's generic characters<sup>3</sup> so insufficient, that it was only by a reference to

<sup>1</sup> P. Z. S. 1879, p. 666.

<sup>2</sup> Mamm. of Austr. i. pl. xxxiii.

<sup>3</sup> P. Z. S. 1866, p. 434.



the type specimen in the British Museum that he had been able to identify the form. He hoped to be able ere long to give a full account of its structure.

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Mr. W. A. Forbes, F.Z.S., Prosector to the Society, read a description of the male generative organs of the Sumatran Rhinoceros (*Rhinoceros sumatrensis*), as observed in an adult male specimen which died in the Society's Gardens in 1879.

This paper will be published in the Society's 'Transactions.'

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Mr. W. K. Parker read the following abstract of a memoir on the structure of the skull in the Chameleons:—

"I have worked out the skull in the adult and newly-hatched young of *Chamæleo vulgaris* and in the adult of *C. pumilus*. The results satisfy me that the Chameleons are a very isolated group, far further removed from the ordinary Lacertilia than even the New-Zealand *Hatteria* (or *Sphenodon*).

"Their skull is extremely ornate, and greatly developed upwards and behind by the breaking up of the parietal region into three bones, the middle piece becoming the large arched crest.

"They have no '*epipterygoidean columella*,' only one vomer, an abortively developed single premaxillary, an arrested auditory apparatus, with no drum-cavity, no cochlea, and no fenestra rotunda. The basihyal is as long as the skull and highly ossified; the teeth are all ankylosed to the upper and lower jaws. These, and many other things, show that these Lizards require to be kept at a great distance (zoologically) from all the other groups.

"By comparing the skulls of the new-born Chameleon, of the adult of the Dwarf Chameleon, and of the adult of the Common Chameleon with those of other Lizards, especially of the typical genus *Lacerta*, I have been able to understand the modifications that have taken place in this most extraordinary type, in the skull of which I have counted as many as twenty-five modifications of structure as compared with what is normal in the Lacertilia.

"A species of Iguanoid from Mexico, viz. *Læmanotus longipes*, has a very small and greatly crested skull, which gives this Lizard a very Chameleonoid appearance. This skull, with that of the less-modified Dwarf Chameleon, has helped me greatly.

"The skull of the newly hatched young of the typical Chameleon comes very near that of the young of any other kind of Lizard in the condition of its roof-bones—the parts that become so transformed afterwards; and in passing from it to the skull of the adult, I have been glad to lay down any stepping-stones I could find.

"At some future time I hope to give the morphology of the skull in *Læmanotus* and in *Hatteria*."

This paper will be published entire in the Society's 'Transactions.'

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The following papers were read:—

1. Liste des Oiseaux recueillis au Nord du Pérou par M. Stolzmann pendant les derniers mois de 1878 et dans la première moitié de 1879. Par M. L. TACZANOWSKI, C.M.Z.S.

[Received February 24, 1880.]

(Plates XX. & XXI.)

Les espèces comprises dans cette liste ont été recueillies dans trois localités, voisines de celles de la liste précédente, et peu éloignées entre elles, mais si différentes sous le rapport des conditions naturelles, que chacune d'elles possède un certain nombre d'oiseaux particuliers. Ces localités sont :

*Chepen*, côte élevée de 400 pieds au-dessus de la surface de l'océan. Le climat y est sec comme sur toute la côte péruvienne. Cà et là on trouve des algarrobes ; dans le voisinage des eaux les saules (*Salix humboldti*) abondent.

*Cutervo*, sierra élevée de 9000 pieds au-dessus du niveau de la mer. La plus grande partie des oiseaux a été recueillie dans une forêt voisine (Montaña de Angurra), située entre 9400 et 10000 pieds d'altitude. Cette forêt abonde en lauriers. Une certaine espèce de *Loranthus* (*Balina*) et un certain *Berberis* attirent les Oiseaux-mouches.

*Callacate* (Quichna), à une altitude renfermée entre 4800 et 5200 pieds. Le caractère de cette localité est analogue à celui du littoral, avec un mélange considérable de plantes serranes. Parmi les plantes caractéristiques on peut citer *Croton*, *Cactus*, *Mimosa*, *Celtis*?, *Bombax*. Comme dans la liste précédente, toutes les espèces non comprises dans les listes antérieures de MM. Jelski et Stolzmann sont marquées d'un astérisque ; 29 espèces sont donc nouvelles pour l'exploration de ces deux voyageurs, et plusieurs d'entre elles nouvelles pour la faune péruvienne.

#### TURDIDÆ.

1. *TURDUS MARANONICUS*, Stolzmann MS. (Plate XX.)

*Turdus*, sp. ?, Tacz. P. Z. S. 1879, p. 221. sp. 2.

*Supra cum alis et cauda fusco-olivaceus unicolor ; subtus albus, fusco crebre squamulatus, pectore fulvo lavato ; ventre medio subcaudalibusque albis immaculatis ; subalaribus margineque interno remigum fulvescentibus ; rostro nigricanti-brunneo.*

♂ et ♀. Tête, dos, ailes et queue d'un brun olivâtre, assez foncé, uniforme ; tout le dessous blanc, lavé légèrement de fauve roussâtre sur la poitrine, et de grisâtre sur les flancs, strié de brun sur la gorge, et squamulé en formant des raies transversales presque continues sur la poitrine et l'abdomen, largement sur la poitrine et les flancs, et moins largement sur l'abdomen ; le milieu du ventre et les subcaudales blanches et unicolores ; subalaires et les plumes axillaires fauves-jaunâtres-pâles, le bord interne des rémiges d'un jaunâtre

plus intense que celui des tectrices subalaires. Bec brun-noirâtre ; pattes brunes ; iris brun-foncé.

Oiseau jeune en premier plumage diffère des adultes par des stries roussâtres, très-fines, sur le milieu de toutes les plumes du sommet de la tête et du dos, qui sur les scapulaires sont presque réduites à la baguette seule dans toute sa longueur ; et toutes ces plumes sont plus ou moins largement bordées d'une nuance plus foncée que le reste du fond ; dans toutes les tectrices alaires la baguette est rousse, élargie à l'extrémité en une large tache terminale ; les grandes tectrices bordées à l'extrémité de roux, en formant une bande transalaire continue. Le dessous du corps est également varié comme dans les adultes, mais les squammules foncées sont plus denses sur la poitrine, et moins larges sur l'abdomen. Bec d'un brun plus pâle ; pattes cornées ; iris brun-foncé.

♂. Long. de l'aile 117, queue 97, bec depuis la commissure 28, tarse 29 mm. ♀. Long. de l'aile 115, queue 95, bec depuis la commissure 28, tarse 28 mm.

Les œufs, trouvés au commencement d'avril, ressemblent à ceux du *T. viscivorus* ; le fond est blanc, légèrement verdâtre, varié de grosses taches irrégulières, pas trop denses, violâtres-pâles, et d'autres brunes-roussâtres assez foncées. Dimensions :  $28 \times 20.3$ ,  $28.2 \times 20.2$ ,  $28.5 \times 20.2$  mm.

Une paire d'adultes et deux jeunes de Callacate ; les adultes en mue fort avancée, recueillis le 16 et le 22 mai ; les jeunes le 20 et le 25 mars 1879.

## 2. TURDUS GIGANTODES, Cab.

Deux mâles et une femelle de Cutervo, tués le 13 novembre, 20 décembre 1878, et le 20 janvier 1879. Iris brun-rougeâtre ; tour des yeux jaune ; bec et pattes rouges-orangées.

L'œuf, trouvé dans les premiers jours de juin, est verdâtre varié sur toute la surface de rares taches irrégulières grises-violâtres-pâles, et brunes-ferrugineuses assez foncées, le gros bout barbouillé presque en entier. Dimensions :  $37.6 \times 27.3$  mm.

## 3. MIMUS LONGICAUDATUS, Tsch.

Un exemplaire de Chepen, tué le 19 septembre 1878, parfaitement identique à ceux de Tumbes, mais, comme il me paraît, distinct des oiseaux des environs de Lima.

## TROGLODYTIDÆ.

### \*1. CAMPYLORHYNCHUS FASCIATUS (Sw.).

*Furnarius fasciatus*, Sw. An. in Men. p. 351.

Deux paires de Callacate, tuées le 17 et le 24 mai 1879, appartenant, selon M. Sclater, à cette espèce. M. Salvin les a comparées avec l'exemplaire typique au Musée de Cambridge. Iris terre-de-Sienne.

Les œufs recueillis en mai sont de la forme de ceux du *C. balteatus*, et aussi blancs, mais plus ou moins maculés de points et de taches rouges, très-petites et presque également disposées sur toute la surface ; sur quelques-uns il y a quelques taches plus grandes que

les autres, mais il y a aussi des œufs très-peu tachetés. Dimensions :  $23.2 \times 16$ ,  $24 \times 16.2$ ,  $24.4 \times 15.4$  mm.

Le *Molothrus purpurascens* dépose quelquefois ses œufs dans les nids de cet oiseau.

2. *THRYOTHORUS SCLATERI*, Tacz. P. Z. S. 1879, p. 222.

Un mâle de Callacate, tué le 29 mars 1879, semblable en tout aux oiseaux typiques de Guajango.

3. *TROGLODYTES AUDAX*, Tsch.

Deux exemplaires de Callacate, tués le 25 et le 27 mars 1879. Iris brun-foncé. Plusieurs pontes recueillies en avril et jusqu'aux premiers jours de juin.

ANTHIDÆ.

*ANTHUS BOGOTENSIS*, Schl.

Un exemplaire de Cutervo, tué en juillet 1879.

SYLVIIDÆ.

\**POLIOPTILA NIGRICEPS*, Baird (*teste* Salvino).

Un mâle de Callacate, tué le 22 mars 1879. Iris brun-foncé.

MNIOTILTIDÆ.

\*1. *GEOTHLYPIS ÆQUINOCTIALIS* (Gm.).

Quatre exemplaires, adultes et jeunes, de Callacate, tués en mai 1879. Iris brun-foncé.

2. *GEOTHLYPIS POLIOCEPHALA*, Baird.

Un jeune mâle de Chepen, tué le 25 septembre 1878; beaucoup plus petit que les oiseaux de Callacate, du versant oriental des Cordilières, et identique au mâle adulte de Tumbes.

3. *BASILEUTERUS NIGRICRISTATUS* (Lafr.).

Un mâle de Cutervo, tué le 4 janvier 1879.

\*4. *BASILEUTERUS TRIFASCIATUS*, Stolz. MS.

*Supra griseo-virescens, subtus luteus; capite supra fascia lata mediana grisea, lateralibus utrinque nigricantibus; superciliis latissimis albido-griseis, striga postoculari nigricante terminatis; gula albida; nucha cinereo-grisea; uropygio viridi; remigibus rectricibusque fuscis viridi limbatis.*

♂ et ♀. Tête grisâtre, à sommet bordé des deux côtés d'une large bande noirâtre, prolongée jusqu'à la nuque, en laissant entre elles une raie grise également large; depuis la naissance du bec s'étend dans toute la longueur de la tête une large raie sourcilière grise-blanchâtre, en arrière de l'œil une raie noirâtre; le bas des joues est d'un gris plus foncé que celui du sourcil; dos gris-verdâtre, cette dernière nuance à peine distincte au cou; croupion vert-jaunâtre. Gorge blanchâtre, le reste des parties inférieures du corps jaune, pâle et moins pur sur la poitrine, pur et beaucoup plus in-

tense sur l'abdomen. Ailes noirâtres; tectrices alaires largement bordées de la couleur analogue au dos, les rémiges à bordures fines d'un vert jaunâtre, la bordure externe de la première blanche; le bord interne de toutes largement blanc; subalaires blanchâtres, axillaires teintées de jaune; queue grise-verdâtre à fines bordures vertes claires; page inférieure des rectrices plus verte qu'en dessus. Bec brun, à mandibule inférieure plus pâle; pattes carnées; iris presque noir. Longueur de l'aile 56-57, queue 51, bec depuis la commissure 15, tarse 21 mm.

Une paire de Callacate, tuée le 21 et le 27 mars 1879.

#### 5. SETOPHAGA BAIRDI, Salv.

Deux femelles de Cutervo, tuées le 6 novembre et le 13 décembre 1878.

### VIREONIDÆ.

#### 1. VIREOSYLVIA OLIVACEA (L.).

Un mâle de Callacate, tué le 4 avril 1879.

#### 2. CYCLORHIS CONTRERASI, Tacz. P. Z. S. 1879, p. 224, tab. xxi.

Trois mâles tués à Callacate le 21 et le 30 mars et le 26 avril 1879. Les individus de cette localité ont le milieu du sommet de la tête plus ou moins coloré de vert, ce qui paraît constituer un passage au *C. virenticeps*, Schl.

### HIRUNDINIDÆ.

#### 1. ATTICORA CYANOLEUCA (Vieill.).

Un exemplaire sans indication de sexe, tué à Callacate le 22 mai 1879.

#### \*2. HIRUNDO LEUCOPYGIA, Stolz. MS.

*Supra nigro-virescens, subtus et in uropygio sericeo-alba; pectore, hypochondriis uropygioque griseo lavatis et fusco subtiliter striatis; alis caudaque nigricantibus; tertiariis ad apicem late albo circumscriptis; subalaribus griseis; rostro brevissimo, nigro; pedibus nigris; iride fusco-brunnea.*

Sommet de la tête en comprenant les lores, la bordure inférieure de l'œil et la région auriculaire, cou et dos noirâtres d'un éclat métallique vert olivâtre; croupion blanc, légèrement lavé de grisâtre et finement strié de lignes noirâtres dans toute la longueur du milieu des plumes; sus-caudales grises avec une mèche médiane foncée et une bordure blanchâtre plus ou moins distincte. Tout le dessous blanc soyeux, gorge et milieu de l'abdomen purs, poitrine et flancs lavés légèrement de grisâtre et variés de longues lignes linéaires foncées; subcaudales blanches pures avec des pareilles lignes foncées médianes sur presque toute la longueur des plumes. Ailes noirâtres avec un très-faible éclat métallique; rémiges tertiaires largement entourées à l'extrémité de blanc, le bordures des secondaires suivantes de plus en plus fines; rectrices de la couleur des ailes, bordées d'un liseré blanchâtre très-fin; subalaires grises, celles du

bord de l'aile bordées de blanchâtre. Bec et pattes noirs; iris brun-foncé.

La femelle semblable en tout au mâle.

Long. de l'aile 92, queue 49, bec depuis la commissure 11, depuis les narines 4, tarse 8 mm.

Forme voisine de *P.H. albiventris*, Bodd., mais beaucoup plus petite, à bec très-court et d'une autre forme à cause de son amincissement brusque vers son extrémité; la couleur des parties supérieures est moins intense, moins métallique sans aucune trace de la nuance bleue; il lui manque aussi de grand espace blanc alaire et du blanc à la naissance des rectrices; le blanc des parties inférieures du corps plus ou moins induit de grisâtre.

Quatre exemplaires de Chepen, tués en septembre 1878.

#### CÆREBIDÆ.

##### 1. DIGLOSSA ALBILATERALIS, Lafr.

Un mâle de Cutervo, 9600 pieds d'altitude, tué le 18 novembre 1878.

##### 2. DIGLOSSA ATERRIMA, Lafr.

Un mâle de Cutervo, tué le 6 novembre 1878.

##### 3. DIGLOSSA PERSONATA (Fras.).

Une paire de Cutervo à 9600-9700 pieds d'altitude, tuée le 31 octobre et le 20 novembre 1878.

##### \*4. CONIROSTRUM SITTICOLOR, Lafr.

Deux oiseaux adultes, dont un mâle, et l'autre sans indication de sexe, tués à Cutervo à 9700 pieds d'altitude, le 20 novembre 1878 et le 2 janvier 1879. Iris brun-foncé.

##### 5. CERTHIOLA MAGNIROSTRIS.

*Certhiola*, sp.?, Tacz. P. Z. S. 1879, p. 225. sp. 8.

Trois exemplaires de Callacate, tués à la fin de mars 1879, sont parfaitement identiques à ceux de Guajango au bord du Marañon, ils sont également d'une taille plus forte que les *Certhiola* de la côte péruvienne, et du versant occidental des Cordilières; leur bec est aussi long que la tête; le miroir alaire aussi bien développé, ainsi que la bande sourcilière. La couleur du dos est distinctement plus claire que dans les oiseaux du versant occidental, avec une légère nuance verdâtre, un peu plus faible que dans les individus de Guajango, mais distincte. On voit donc que les oiseaux du versant oriental sont distincts de ceux du versant occidental, et se reconnaissent facilement au premier coup d'œil; ils méritent donc à être considérés comme une race locale.

Les œufs, recueillis dans la moitié d'avril, sont ovés, assez longs, à coque mate, d'un blanc légèrement verdâtre, variée de taches irrégulières brunes ou brunes-roussâtres, assez foncées, plus ou moins nombreuses sur toute la surface, et formant une couronne plus dense

autour du gros bout. Cette coloration ressemble à celle du Friquet (*Passer montanus*). Dimensions :  $18.3 \times 12.4$ ,  $18.4 \times 13$  mm.

#### TANAGRIDÆ.

##### 1. EUPHONIA NIGRICOLLIS (Vieill.).

Trois exemplaires de Callacate, tués à la fin de mars. Les jeunes commençant à prendre leur livrée d'adultes.

##### \*2. EUPHONIA SERRIROSTRIS, ScL.

Quatre mâles et deux femelles, pris à Callacate entre le 25 mars et la fin de mai. Les mâles ne se distinguent de ceux de *E. chlorotica* de Cayenne que par le jaune beaucoup plus clair, surtout au front. Ils paraissent être un peu plus forts, leur aile pliée dépasse de 2 mm. celle des oiseaux de la Guyane, et diffère encore par la disposition de blanc sur les rémiges primaires. La femelle ressemble à la *E. serrirostris*, Orb. Voy. Amér. mérid. Elle a également le milieu de la poitrine et de l'abdomen largement blanc, mais moins pur que dans la figure de l'ouvrage cité, qui présente en général les couleurs plus vives.

##### 3. CALLISTE NIGRIVIRIDIS (Lafr.) : Tacz. P. Z. S. 1879, p. 226.

Un jeune oiseau tué à Tambillo dans la moitié de juin.

Cet premier plumage diffère beaucoup de celui des adultes. Le sommet de la tête jusqu'à la nuque est noirâtre, légèrement varié par les extrémités des plumes verdâtres, peu distinctes; ces extrémités beaucoup plus volumineuses forment sur les côtés un large sourcil vert-roussâtre, de plus en plus élargi en arrière et occupant tous les côtés du cou; le dos est noirâtre, uniforme au milieu, et squammulé de bordures verdâtres sur les scapulaires; croupion gris-olivâtre squammulé de verdâtre, tout le dessous est fauve, maculé de verdâtre sur les côtés de la gorge, et teint de grisâtre sur les flancs de la poitrine et de l'abdomen. Ailes et queue noirâtres, à rémiges et rectrices bordées de vert bleuâtre; les bordures des grandes tectrices jaunâtres sur l'extrémité des plumes formant une bande à travers l'aile, celles des petites couvertures olivâtres et moins prononcées. Bec noirâtre; pattes carnées.

##### \*4. PÆCILOTHRAUPIS PALPEBROSA (Lafr.).

*Pæcilothraupis lacrymosa*, Tacz. P. Z. S. 1879, p. 227.

Deux mâles et trois femelles de Cutervo, recueillis entre le 30 octobre et le 16 décembre 1878, ainsi qu'un mâle de Tambillo tué le 1 février de la même année, appartiennent à cette forme et non à celle du Pérou central fournie par M. Jelski en 1873 de Maraynioc et de Higos. Tous ces exemplaires du Pérou septentrional ont, comme les oiseaux de la Nouvelle Grenade, le dessus de la tête et le dos d'un ardoise foncé, avec une très-faible nuance bleue à peine distincte, tandis que les oiseaux du Pérou central ont cette dernière nuance bien prononcée sur un fond ardoise; le bleu du croupion est plus foncé et moins luisant; une teinte olive distincte sur les côtés de la

tête; la tache jaune postauriculaire bien développée et le jaune des parties inférieures du corps plus clair.

5. *TANAGRA CÆLESTIS*, Spix.

Un mâle tué à Callacate le 22 avril 1879.

6. *TANAGRA DARWINI*, Bp.

Trois mâles tués à Callacate en mars et en avril.

Les œufs, recueillis à la fin d'avril, sont d'un blanc sale, variés sur toute la surface de nombreuses taches irrégulières grises-brunâtres-pâles, et d'autres brunes-noirâtres beaucoup moins nombreuses; ces dernières sont de différentes formes irrégulières, en gouttes grosses ou petites, en traits plus ou moins longs, en veines, etc. La coque est verdâtre dans sa transparence. Dimensions:  $25 \times 18.2$ ,  $27 \times 18$ ,  $27.6 \times 19$  mm.

7. *PYRANGA AZARÆ* (Orb. et Lafr.).

Un jeune mâle prenant son habit d'adulte, tué à Callacate le 25 avril 1879, est d'un rouge beaucoup plus sombre qu'à l'ordinaire.

\*8. *PYRANGA RUBRICEPS*, Gr.

Une paire de Cutervo, tuée le 13 et le 22 novembre 1878.

9. *NEMOSIA INORNATA*, Tacz. P. Z. S. 1879, p. 228.

Deux mâles de Callacate du 28 mars et le 3 avril 1879.

10. *NEMOSIA ORNATA*, Scl.

Une femelle de Cutervo, tuée le 30 janvier 1879.

11. *CHLOROSPINGUS SUPERCILIARIS* (Lafr.).

Un mâle et deux femelles de Cutervo, du 11-17 novembre 1878.

*CHLOROSPINGUS BERLEPSCHI*, n. sp.<sup>1</sup>

*Chlorospingus castaneicollis*, Tacz. P. Z. S. 1874, p. 517.

*Supra olivaceo-griseus, pileo nuchaque plumbeo-cinereis, loris cum regionibus ophthalmica et parotica nigris; subtus fulvus, gula cum pectore subcaudalibusque rufis, hypochondriis griseo lavatis; alis fuscis olivaceo limbatis, cauda subrufescente; subalaribus et margine interno remigum fulvis.*

Femelle adulte. Dos gris légèrement olivâtre, sommet de la tête jusqu'à la nuque d'un cendré plombé; côtés du visage comprenant les lores, tour des yeux, région auriculaire et le bas du visage noirs; gorge, haut de la poitrine et subcaudales d'une belle couleur rousse semblable à celle de la femelle du *Ch. castaneicollis*; milieu de l'abdomen d'une nuance fauve roussâtre, bien différente et nettement tranchée de celle de la poitrine et des subcaudales, côtés induits de gris olivâtre. Ailes grises-foncées, à petites tectrices cendrées, rémiges primaires bordées d'olive jaunâtre, les bordures des

<sup>1</sup> Comme cette espèce n'appartient pas à la faune de la contrée dont nous nous occupons, j'y place sa description sans numéro.



secondaires, des tertiaires et des grandes tectrices sont d'une nuance plus analogue à celle de l'abdomen. Bec noirâtre; pattes de la couleur carnée; iris brun-foncé. Longueur de l'aile 69, queue 61, bec depuis la commissure 13.5, tarse 20 mm.

Espèce voisine du *Ch. castaneicollis*, Scl., mais parfaitement distincte par la couleur grise et non noire du sommet de la tête, le manque complet du sourcil blanc, la nuance différente de la gorge et des subcaudales de celle de l'abdomen, la couleur fauve des subalaires et de la bordure interne des rémiges au lieu de blanche, la couleur différente des rectrices, de la bordure des primaires, bec plus court etc.

Ropaybamba, au Pérou central (*Jelski*, 1872).

Je dédie cette nouvelle espèce à M. le comte H. de Berlepsch, comme hommage pour son empressement avec lequel il a daigné de me venir en aide en comparant plusieurs espèces péruviennes dans sa riche collection.

\*12. *ARREMON NIGRICEPS*, n. sp.

*Pileo, loriscum genis et torque collari nigris; superciliis latissimis a rostro usque ad nucham ductis cum gula candidis; semitorque nuchali cinereo; dorso, scapularibus, uropygio et tectricibus alarum minoribus olivaceo-viridibus; alis caudaque schistaceis, flexura alari flavida; pectore abdomineque albis, hypochondriis cinereis; crisso subcaudalibusque fulvido tinctis; rostro nigro; pedibus carneis; iride fusco-brunnea.*

♂. Le mâle adulte a tout le sommet de la tête jusqu'à la nuque, les lores et les côtés du visage, ainsi qu'un demi-collier guttural d'un noir intense; une large bande sourcilière depuis la naissance du bec, prolongée jusqu'à la nuque et de plus en plus s'élargissant en arrière, ainsi que la gorge blanches pures; un demi-collier gris cendré assez large occupe le derrière et les côtés du cou; le dos, les scapulaires, les petites couvertures alaires et le croupion sont d'une belle couleur olive verdâtre; ailes et queue schistacées, rémiges primaires bordées d'un liséré assez large d'un cendré plus clair; le bord du devant de l'aile jaune pâle; bord interne des rémiges largement blanchâtre; subalaires blanches; axillaires blanches, légèrement teintées de jaune; tout le dessous du corps blanc, côtés de la poitrine et de l'abdomen cendrés; bas ventre et subcaudales légèrement teints de fauve. Bec noir; pattes d'un carné légèrement brunâtre; ongles cornés clairs; iris brun-foncé.

Longueur totale 150, aile 78, queue 65, bec depuis la commissure 16, tarse 24, doigt médian avec l'ongle 19 mm.

Mâle unique tué à Callacate le 17 mai 1879.

\*13. *BUARREMON ASSIMILIS* (Boiss.).

Onze exemplaires des deux sexes de Cutervo et de Callacate, tués entre le 9 décembre 1878 et le 31 mai 1879. Iris cerise-brunâtre. Un œuf, trouvé à Callacate au commencement d'avril, est allongé, ové, presque mate, verdâtre pâle, uniforme. Dimensions: 29 × 21.5 mm.

## 14. BUARREMON BRUNNEINUCHA (Lafr.).

Un mâle de Cutervo à 9700 pieds d'altitude, tué le 5 décembre 1879.

## 15. BUARREMON LATINUCHUS, Du Bus.

Un mâle de Cutervo, tué le 20 décembre 1878. Cet exemplaire se distingue des oiseaux de Tambillo par le roux de la nuque graduellement pâli en une nuance beaucoup plus claire que celle du devant de la tête.

M. Stolzmann écrit dans une de ses dernières lettres : — “ On a tort de réunir dans un seul genre tous les Buarremons, car il renferme deux groupes parfaitement distincts, non seulement par les formes extérieures du corps, mais plus encore par leurs habitudes. Dans le groupe dont le *B. torquatus* (Orb.) est le type, le bec est plus long, la queue moins longue et composée de rectrices plus élargies, les pattes plus fortes (ce qui a rapport avec leurs habitudes), le plumage plus abondant et plus lisse. Dans l'autre groupe le corps est plus svelte, la queue plus longue, le bec plus court etc.

“ Le premier groupe est humicole, tandis que l'autre est buissonnier et même arboricole ; ces oiseaux se perchent sur les buissons, sautillant de branche en branche, et montent souvent sur les arbres élevés, ce que je n'ai jamais remarqué dans les premiers. Les oiseaux du groupe des humicoles cherchent exclusivement leur nourriture par terre, et principalement en fouillant sous les feuilles sèches, qu'ils rejettent au loin avec leur bec, et se tiennent dans des fourrés les plus épais ; tandis qu'on rencontre souvent les buissonniers dans les buissons plus ou moins rares. Je n'ai pas eu d'occasion d'observer les *B. tricolor* et *B. taczanowskii* du Pérou central vivants, mais je ne doute pas qu'ils ont les mêmes habitudes que le *B. latinuchus*.

“ Leur chant présente une grande différence ; celui du *B. assimilis* et du *B. brunneinuchus* est fin et très-élevé, semblable au sifflement d'une poupée en caoutchouc, tandis que le chant du *B. latinuchus* ressemble à celui du *Molothrus purpurascens*, qu'on pourrait comparer à celui du Serin des Canaries.

“ Il y a encore une différence importante qu'on remarque pendant la préparation des peaux : en dépouillant le *B. brunneinuchus* et *B. assimilis* il faut faire attention en séparant les rémiges secondaires des os de l'avant bras, et ne le jamais faire à l'aide de l'ongle du pouce, comme cela a lieu ordinairement ; mais il faut séparer la racine de chaque plume avec le scalpel, car autrement toutes les rémiges tombent comme dans les Piaya. Avec le *B. latinuchus* on peut procéder comme on le veut, les plumes tiennent fort.

“ Enfin il y a une certaine constance caractéristique dans la coloration des deux groupes et dans la disposition de leurs couleurs, comme dans les oiseaux humicoles : les trois lignes frontales blanches, couleur olive-verdâtre du dos, blanche dessous, etc.”

Pour appuyer cette opinion de Mr. Stolzmann on trouve une petite remarque dans le voyage de D'Orbigny p. 284, qui dit sous le *B. rufinuchus* : — “ Elle se tient toujours au plus épais des fourrés

dans les ravins, loin des habitations ; elle est néanmoins peu craintive, vivant isolée, *sans descendre à terre*, sautillant sans cesse de branche en branche," etc.

Tous ces caractères sont suffisants pour motiver la séparation générique de ces deux groupes, et pour ranger les oiseaux buissonniers dans le genre *Carenochrous*, Scl. Dans les vrais Buarremons il ne resterait donc que le *B. torquatus* (Lafr. et Orb.), *B. assimilis* (Boiss.), *B. brunneinuchus* (Lafr.), *B. inornatus*, Scl., *B. virenticeps*, Bp., et peut-être le *B. chrysopogon* (Bp.).

#### CONOTHRAUPIS, Scl. MS.<sup>1</sup>

*Rostrum subconicum, tomis medio profunde emarginatis. Alæ breves, subrotundata, remigum tertio et quarto omnium longissimis, secundo vix brevior. Cauda apice rotundata. Pedes debiles. Habitus generalis Buarremonis.*

##### \*16. CONOTHRAUPIS SPECULIGERA. (Plate XXI.)

*Schistochlamys speculigera*, Gould, P. Z. S. 1855, p. 69 : Scl. P. Z. S. 1856, p. 68.

*Diucopsis speculigera*, Gray, Hand-list Birds Brit. Mus. ii. p. 76 : Scl. et Salv. Nomcl. Av. Neotr. p. 26.

*Nigro-coracina, pectore medio, abdomine, speculo alari maculaque sub nuchæ pennis obtecta albis ; uropygio hypochondriisque schistaceis ; rostro pedibusque nigris ; iride rubro-brunnea. Long. tota 154, alæ 75, caudæ 68, rostri a commissura 17, tarsi 21, digiti medii 22 mill.*

Trois mâles de Callacate, tués le 20 et le 22 avril et le 24 mai 1879.

##### 17. SALTATOR ALBICOLLIS, Vieill.

Une femelle adulte de Chepen, tuée le 19 septembre 1878, identique aux oiseaux des environs de Lima. Quatre exemplaires de Callacate, tués entre le 26 mars jusqu'à la fin de mai 1879, fort striés sur les parties inférieures du corps, semblables en tout à ceux de Guajango sur le Marañon.

Les œufs, trouvés au commencement d'avril, sont ovés, allongés, à fond vert bleuâtre, plus intense que celui des œufs du *S. laticlavus*, et orné au gros bout d'une couronne composée de veines noires, plus ou moins subtiles et entortillées de différentes manières et de quelques points. Dimensions : 26.8 × 17, 29 × 19 mm.

##### 18. SALTATOR LATICLAVUS, Scl. et Salv.

Les œufs, trouvés à Cutervo au commencement de février, sont ovés, allongés, à fond vert bleuâtre pâle, varié au gros bout de quelques grosses veines, de traits et de quelques points noirs. Dimensions : 30 × 20 mm.

<sup>1</sup> Vide Ibis, 1880, p. 252.

## FRINGILLIDÆ.

1. *PHEUCTICUS CHRYSOGASTER* (Less.): Tsch. Faun. Peru. p. 222.

*Pheucticus chrysopeplus*, Tacz. P. Z. S. 1874, p. 519.

Une paire de Callacate, tuée le 5 et le 18 avril 1879. Iris brun-foncé.

2. *SPERMOPHILA SIMPLEX*, Tacz. P. Z. S. 1874, pp. 132 et 519.

Six mâles tués à Callacate, depuis le 25 mars jusqu'au 25 avril 1879.

3. *SPERMOPHILA OBSCURA*, Tacz. P. Z. S. 1874, p. 519.

Deux mâles et une femelle, tués à Callacate le 31 mars et le 5 et 18 avril 1879.

La femelle ne diffère en rien du mâle, elle est seulement un peu plus petite, aile pliée 53, queue 40 mm. Les deux mâles sont aussi d'une taille un peu moins forte que celui de Paltaypampa, aile longue de 54 et de 55 mm. Mandibule supérieure dans tous ces individus brune, l'inférieure jaune.

4. *SPERMOPHILA GUTTURALIS* (Licht.).

Un mâle adulte et deux jeunes mâles, recueillis à Callacate entre le 31 mars et la fin de mai.

5. *PIEZORHINA CINEREA* (Lafr.).

Un mâle tué à Chepen le 27 septembre 1878.

6. *VOLATINIA JACARINA* (L.).

Deux mâles de Callacate du 16 et du 31 mars 1879.

7. *CATAMENIA INORNATA* (Lafr.).

Deux mâles et un jeune de Cutervo du 30 décembre, et un jeune de Tambillo tué en juillet.

8. *ZONOTRICHIA PILEATA* (Bodd.).

Une femelle de Cutervo du 14 janvier 1879.

9. *PHRYGILUS GAYI* (Eyd. et Gerv.).

Deux mâles du 24 décembre et du 12 janvier de Cutervo.

10. *CHRYSOMITRIS COLUMBIANA* (Lafr.).

Cinq exemplaires des deux sexes de Callacate, recueillis depuis le 29 mars jusqu'au 12 mai 1879.

11. *CHRYSOMITRIS CAPITALIS*, Cab.

Un mâle de Cutervo du 14 janvier 1879.

12. *SYCALIS FLAVEOLA* (L.).

Une paire de Callacate à 4800 pieds d'altitude, tuée le 21 mars et le 3 avril 1879.

## ICTERIDÆ.

1. *ICTERUS MESOMELAS*, Wagl.

Un mâle adulte et un jeune, tués à Callacate le 27 mars et le 23 avril 1879.

2. *TRUPIALIS LOYCA* (Molina).

Deux mâles tués à Cutervo le 14 janvier et le 15 février 1879.

3. *MOLOTHRUS PURPURASCENS* (Hahn).

Deux mâles et une femelle de Callacate, tués au commencement d'avril 1879. Iris brun-foncé.

## DENDROCOLAPTIDÆ.

1. *GEOSITTA TENUIROSTRIS* (Orb. et Lafr.).

Trois mâles tués à Cutervo le 12 et le 14 janvier 1879. Iris brun-foncé.

2. *UPUCERTHIA SERRANA*, Tacz. P. Z. S. 1874, p. 525.

Un mâle tué à Cutervo le 20 décembre 1878, à 9000 pieds d'altitude.

3. *SYNALLAXIS ANTISIENSIS*, Scl.

Deux femelles tuées à Cutervo le 20 décembre 1878 et le 12 février 1879.

4. *SYNALLAXIS FRUTICICOLA*, Tacz. P. Z. S. 1879, p. 670.

*Synallaxis frontalis*, Tacz. (nec Pelz.) P. Z. S. 1879, p. 230.

Un mâle tué à Cutervo le 13 décembre 1878.

5. *PHACELLODOMUS FRONTALIS* (Licht.).

Un exemplaire tué à Callacate le 27 mars 1879.

Les œufs, recueillis en avril, mai et juin, sont ovés, à surface mate et rugueuse distinctement à l'œil nu, blanc pur. Dimensions :  $23 \times 16.3$  ;  $22 \times 16.3$  mm.

6. *PSEUDOCOLAPTES BOISSONNEUTI* (Lafr.).

Un mâle et deux femelles de Cutervo à 9600-9700 pieds d'altitude, tués le 9 mai 1879 et le 13 et 18 novembre 1878. Iris brun-foncé.

Ces oiseaux de Cutervo présentent certaines différences de celui de Maraynioc au Pérou central : ils ont le bec beaucoup plus long, surtout dans la femelle (38 mm. depuis la commissure, et 28 dans le mâle) ; dans le mâle de Maraynioc il n'est que de 23 mm. Dans la coloration on voit aussi quelques différences ; le fond du sommet de la tête est plus noir dans les oiseaux de Cutervo, et plus brun dans l'oiseau de Maraynioc ; le fond de l'abdomen plus roussâtre dans les oiseaux de Cutervo, et plus brunâtre et plus foncé dans celui du Maraynioc.

M. le comte H. de Berlepsch, en comparant une femelle de Cutervo avec quatre oiseaux de la Nouvelle Grenade, a trouvé sur la première

les bordures foncées des plumes de la gorge et de la poitrine plus larges et plus prononcées, le fond de ces parties plus jaunâtre; la couleur roussâtre de l'abdomen plus claire. L'exemplaire péruvien a aussi les ailes et la queue plus longues que ceux de la Nouvelle Grenade.

7. *MARGARORNIS SQUAMIGERA* (Orb. et Lafr.).

Trois exemplaires de Cutervo à 9800 pieds d'altitude, tués le 18 octobre et le 9 décembre 1878, et le 9 mai 1879.

8. *PICOLAPTES LACRYMIGER* (Des Murs).

Un mâle de Cutervo à 9600 pieds d'altitude, tué le 20 novembre 1878.

FORMICARIIDÆ.

1. *THAMNOPHILUS ALBINUCHALIS*, Scl.

Une femelle de Callacate, tuée le 27 avril 1879.

\*2. *THAMNOPHILUS SUBFASCIATUS*, Scl. et Salv. P. Z. S. 1876, p. 357, tab. xxxiii.

Un mâle tué à Cutervo à 9000 pieds d'altitude, le 11 novembre 1878. Iris d'un brun très-pâle.

\*3. *GRALLARIA ALBILORIS*, sp. nov.

Deux paires de Cutervo et de Callacate, tuées en décembre 1878, en avril et en mai 1879.

Ces oiseaux, comparés avec le *Gr. ruficapilla* d'Antioquia, présentent certaines différences : ils ont le bec distinctement plus long, la coloration en général plus pâle, surtout celle de la tête, qui est d'un roux beaucoup moins intense et moins pure en dessus, et ne s'étendant pas aussi loin sur les côtés du visage et sur le derrière du cou ; les lores et les côtés du dos sont blanchâtres, à extrémités des plumes noires ; toute la partie antérieure du visage est de la même couleur, tachetée de noirâtre, entourant presque entièrement l'œil ; la région auriculaire est brune-roussâtre, et plus ou moins blanchâtre dans sa partie inférieure ; la couleur générale du dos est moins foncée ; le fond des parties inférieures du corps teint d'une nuance fauve très-légère, mais bien distincte ; les stries blanches du croupion plus développées surtout dans le mâle. Iris brun très-foncé.

♂. Long. de l'aile 104 mm., queue 67, bec depuis la narine 17, tarse 52, doigt médian avec l'ongle 34 mm. ♀. Long. de l'aile 99, queue 62, bec depuis la narine 16, tarse 54, doigt médian avec l'ongle 36 mm.

Il est probable que c'est une espèce distincte, habitant cette contrée ; il serait donc intéressant de connaître les limites de sa distribution.

Les œufs, trouvés dans la moitié d'Avril et à la fin de mai, sont courts, à surface presque mate, d'un vert bleuâtre pâle et uniforme. Dimensions : 29 × 24 ; 29 × 25 ; 30.6 × 25.2 mm.

## PTEROPTOCHIDÆ.

## \*SCYTALOPUS MAGELLANICUS (Lath.).

Trois mâles et une jeune femelle de Cutervo, tués entre le 18 novembre et le 9 décembre 1878, à une altitude de 9800 pieds. Iris brun-foncé.

## TYRANNIDÆ.

## 1. OCHTHODIETA FUMIGATUS (Boiss.).

Un mâle et deux femelles de Cutervo à 9600-9800 pieds d'altitude, tués en novembre et en décembre 1878. Iris brun-foncé.

## \*2. OCHTHÆCA FUMICOLOR, Scl.

Une femelle de Cutervo à 9000 pieds d'altitude, tuée le 27 novembre 1878. Iris brun-foncé.

3. OCHTHÆCA LEUCOMETOPA, Scl. et Salv. P. Z. S. 1877, p. 19.  
*O. leucophrys*, Tacz. P. Z. S. 1874, p. 533.

Une femelle de Cutervo, tuée le 4 janvier 1879.

## 4. OCHTHÆCA LESSONI, Scl.

Une femelle de Cutervo du 30 octobre 1878.

## \*5. OCHTHÆCA RUFIMARGINATA (Lawr.).

Un mâle et deux femelles de Cutervo, tués à 9700-9800 pieds d'altitude, le 31 octobre et le 15 et 18 décembre 1878. Iris brun-foncé.

## 6. OCHTHÆCA STICTOPTERA (Scl.).

Deux mâles et une femelle de Cutervo, tués à 9600 pieds d'altitude entre le 11 novembre 1878 et le 7 janvier 1879. Iris brun-foncé.

## 7. TODIROSTRUM CINEREUM (L.).

Un mâle tué à Callacate le 30 mars 1879. Iris blanc.

## 8. EUSCARTHUS FULVICEPS, Scl.

Un mâle et deux femelles, tués à Chepen et à Callacate le 26 septembre 1878 et le 28 mars 1879. Iris brun-foncé.

## 9. ANÆRETES PARULUS (Kittl.).

Un exemplaire de Cutervo du 27 novembre 1878. Iris blanc-jaunâtre.

## 10. PHYLLOMYIAS TUMBEZANA, Tacz. P. Z. S. 1877, p. 325.

Une femelle de Chepen du 27 septembre 1878.

## 11. ORNITHION IMBERBE, Scl.

Deux mâles de Callacate du 5 et du 6 avril 1879.

12. *TYRANNISCUS NIGRICAPILLUS* (Lafr.).

Trois exemplaires de Cutervo, tués en novembre 1879. Iris brun-foncé.

13. *ELAINEA LEUCOSPODIA*, Tacz. P. Z. S. 1877, p. 325.

Cinq femelles tuées à Chepen en septembre 1878.

14. *ELAINEA OBSCURA* (Lafr. et Orb.).

Un jeune tué à Callacate le 18 mai 1879.

15. *MYIODYNASTES ATRIFRONS*, Salv.

Un mâle de Chepen, tué le 23 et le 26 septembre 1878. Iris brun-foncé.

16. *MYIOBIUS RUFESCENS*, Salv.

Une paire de Chepen, tuée le 23 et le 26 septembre 1878. Iris brun-foncé.

17. *MYIOBIUS CRYPTERYTHRUS*, Scl.

Trois mâles et une femelle de Callacate, tués entre le 21 mars et le 3 avril 1879.

18. *PYROCEPHALUS RUBINEUS* (Bodd.).

Quatre exemplaires de Callacate, tués en avril et en mai 1879.

19. *CONTOPUS PUNENSIS* (Lawr.).

Quatre exemplaires de Callacate, tués en avril et en mai 1879.

20. *MYIARCHUS NIGRICEPS*, Scl.

Trois mâles de Cutervo et de Callacate, tués en décembre 1878 et en mars et avril 1879.

21. *MYIARCHUS SEMIRUFUS*, Scl. P. Z. S. 1878, p. 148, tab. xi. ; Tacz. P. Z. S. 1879, p. 236.

Deux mâles et une femelle de Chepen, tués en septembre 1878. La femelle ne diffère en rien du mâle, elle est seulement un peu plus petite, l'aile pliée est de 3 mm. moins longue.

22. *SERPOPHAGA CINEREA* (Strickl.).

Un œuf trouvé à Tambillo au commencement de juillet 1878 est ové, à petit bout légèrement atténué, d'une couleur jaunâtre sale, complètement mate. Dimensions : 16.8 × 12 mm.

## COTINGIDÆ.

1. *PACHYRHAMPUS ALBOGRISEUS* (Scl.).

Deux mâles de Callacate, tués le 20 et le 25 avril 1879.

2. *HELIOCHERA RUBROCRISTATA* (Orb. et Lafr.).

Deux mâles de Cutervo, tués le 31 octobre et le 30 décembre 1879.



## TROCHILIDÆ.

\*1. PHAETHORNIS GRISEOGULARIS, Gould (*teste* Gouldo).

Trois exemplaires, recueillis à Callacate en mars et en mai 1879, parfaitement d'accord avec la description de M. Deslongchamps dans le 'Catalogue descriptif des Oiseaux du Musée de Caen,' p. 71.

## 2. LAFRESNAYA GAYI (Bourc. et Muls.).

Mâle adulte et un jeune mâle de Cutervo à 7900 pieds d'altitude, recueillis le 25 et le 29 novembre 1878.

## 3. FLORISUGA MELLIVORA (L.).

Deux mâles tués à Callacate le 20 avril 1879.

## 4. PETASOPHORA ANAIS (Less.).

Une femelle de Callacate du 21 avril 1879.

## 5. PANOPLITES MATHEWSI (Bourc.).

Trois mâles et une femelle de Cutervo et de Callacate à 9600-9800 pieds d'altitude, recueillis en novembre, en mars et en avril.

## 6. PTEROPHANES TEMMINCKI (Boiss.).

Un exemplaire sans indication de sexe, tué à Cutervo à 9700 pieds d'altitude, le 6 novembre 1878.

## 7. DOCIMASTES ENSIFERUS (Boiss.).

Deux mâles tués à Cutervo à 10,000 pieds d'altitude, le 31 octobre et le 29 novembre 1878.

## 8. DIPHLOGÆNA WARSZEWICZI (Reichb.).

*Cœligena warszewiczi*, Reichb. Aufz. der Colib. p. 23.

*Helianthea aurora*, Gould, P. Z. S. 1853, p. 61, f. 2; Bp. Rev. et Mag. Zool. 1854, p. 251; Cab. et Hein. Mus. Hein. iii. p. 80, nota 6.

*Hypochrysis aurora*, Reichb. Aufz. d. Colib. p. 9; id. Troch. Enum. p. 6 (1855).

*Leadbeatera warszewiczi*, Reichb. Aufz. d. Colib. p. 9; id. Troch. Enum. p. 6, tab. dexc. f. 4526 (1855).

*Diphlogæna aurora*, Gray, H.-list Birds Brit. Mus. i. p. 138: Scl. et Salv. Nom. Av. Neotr. p. 90.

*Rostrum nigrum, rectum, subcylindricum, dimidia parte corporis longius. Caput triangulare, supra usque ad nucham squamosum, splendidissime viride, cæruleo aureoque micans; mento, gula, lateribus capitis pectoreque viridibus, squamulosis, splendidis; nucha nigricante. Dorsum, cauda profunde emarginata, abdomen subcaudalesque cinnamomeo-rufa unicoloria; alis rufis, remigibus apice brunnescentibus.*

♂. Long. tota 130, rostri 32, alæ 82, caudæ 53, distantia ab apicibus rectricum mediarum ad apices externarum 16 mill. ♀. Long. tota 125, rostri 32, alæ 72, caudæ 48, distantia ab apicibus rectricum mediarum ad apices externarum 10 mill.

♂ ad. Bec noir, droit, cylindrique jusque près de son extrémité,

où il est brusquement aminci en pointe, plus long que la moitié du corps. Tête triangulaire, parée en dessus dans toute sa longueur d'une plaque de plumes squammiiformes, de plus en plus longues vers la nuque d'un vert métallique fort luisant, passant sous certain jour au bord postérieur de la plaque en doré et cuivreux, et dans toute son étendue en bleu saphir, plus ou moins violacé dans d'autres directions de la lumière, surtout vus d'arrière en avant; quelques-uns possèdent en outre dans le milieu de la partie postérieure de la plaque quelque plumes d'un saphir fort splendide. Le menton, la gorge et les côtés de la tête couverts par des plumes squammiiformes vertes, changeant en bleu, et presque aussi splendides que celles de la calotte; poitrine et côtés du cou verts, mais moins brillants; nuque d'un noir fuligineux mate; dans l'angle postérieur de l'œil une petite tache blanche. Le reste, comme tout le dos, croupion, queue profondément échancrée, abdomen, subcaudales, subalaires et ailes, d'un roux cannelle presque uniforme partout, excepté les parties inférieures du corps, qui sont d'une nuance un peu plus pâle; rémiges terminées d'un brun légèrement bronzé, de plus en plus vers le bord de l'aile; dans la première il ne reste de roux que la barbe externe dans toute sa longueur; les grandes et les moyennes tectrices primaires largement terminées de noir-verdâtre. Pattes brunes; tarse garni de plumes blanchâtres; iris presque noir.

♀. D'un roux moins pur au dos et plus pâle en dessous, a le devant du visage roux; tout le sommet de la tête, ainsi que la nuque et le côté postérieur du cou couvert de plumes grises foncées à la naissance, et de vert métallique peu brillant ensuite, et terminées d'une bordure rousse bien distincte sous certain jour; la gorge, le haut de la poitrine et les côtés du cou sont également colorés, mais le gris de la base des plumes est moins foncé, le vert un peu plus brillant et les bordures rousses plus prononcées. Les ailes et la queue comme dans le mâle, ne présentant que cette différence que les grandes et moyennes tectrices alaires sont d'un noir verdâtre en entier, formant une grande tache continue au lieu des deux du mâle; bas ventre blanchâtre. La moitié basale de la mandibule inférieure carnée, passant graduellement en brunâtre vers l'extrémité, qui est noire.

Quatre mâles adultes et une femelle tués à Cutervo à 9600-9700 pieds d'altitude, en novembre, décembre et mai.

#### 9. *HELIOTRYPHA VIOLA* (Gould).

Un mâle et quatre femelles de Cutervo, tués en novembre, décembre et mai.

#### \*10. *HELIOTRYPHA MICRASTER* (Gould).

Sept mâles et quatre femelles de Cutervo à 9600-9800 pieds d'altitude, recueillis en novembre, décembre et janvier.

Les mâles dans leur éclat le plus parfait ont la plaque gutturale d'une magnifique couleur rouge de feu, analogue à celle d'un cigarre allumé, changeant sous certains jours en jaune et orangé, et en vert clair vus d'arrière en avant; les plumes de cette plaque sont plus raides que dans les autres espèces du genre. La plaque verte frontale

est petite, moins étendue que dans la *H. viola*. Le menton noir mate. Le vert bronzé des parties supérieures du corps est plus bronzé sur la tête qu'au dos, et plus encore au croupion et les sus-caudales. Le milieu du ventre est d'un fauve roussâtre, tacheté de vert ; les plumes des tibias rousses. Tous les individus ont la tache blanche postoculaire bien prononcée.

La femelle est semblable au mâle et en diffère principalement par la plaque gutturale plus petite un peu moins vive ; le menton est blanchâtre à base de plumes grise ; le milieu de l'abdomen largement fauve isabelle ; plumes des tibias de la même nuance ; le vert des parties supérieures du corps plus clair et moins bronzé sur la tête et surtout au croupion ; les deux rectrices médianes aussi vertes que la croupion ; les rectrices externes et les submédianes terminées d'une fine bordure grise-blanchâtre.

♂. Long. de l'aile 66 mm., queue 42, bec 19, différence entre les rectrices médianes et les externes 7. ♀. Long. de l'aile 59-62, queue 39, bec 19 ; différence entre les rectrices médianes et les externes 5 mm.

#### 11. *CHÆTOCERCUS BOMBUS*, Gould.

Une paire de Callacate, tuée le 6 et le 22 avril 1879.

#### 12. *THAUMASTURA CORA* (Less.).

Un mâle en plumage de transition de Chepen, tué le 19 septembre 1878.

#### 13. *MYRTIS FANNY* (Less.).

Un mâle et deux femelles de Callacate, avril 1879.

#### 14. *LESBIA GRACILIS*, Gould ; Tacz. P. Z. S. 1879, p. 238.

Deux mâles adultes et une femelle de Cutervo, tués en décembre et en mai. Mr. Elliot, dans son récent travail sur les Oiseaux-Mouches ('Classification and Synopsis of the Trochilidæ,' 1879), a réuni cette forme avec la *L. gouldi*. La comparaison des deux mâles adultes de ce dernier envoi avec les oiseaux de la Colombie m'a conduite à une opinion contraire. Je trouve la différence principale dans la couleur de la queue, et surtout dans les deux rectrices externes, qui dans nos individus péruviens sont d'un noir intense, presque velouté, avec un très-faible éclat bleuâtre à peine distinct sous certain jour, tandis que dans la *L. gouldi* cette rectrice est lustrée de vert dans presque toute sa longueur ; la tache terminale verte brillante est beaucoup plus petite, et surtout moins large ; la bordure grise-blanchâtre est plus claire dans les oiseaux péruviens et dépasse de 5-7 mm. l'extrémité des rectrices suivantes, tandis que dans l'oiseau de la Colombie cette nuance ne les dépasse pas ; la page inférieure est violâtre dans presque toute sa longueur dans les oiseaux péruviens, tandis que cette nuance ne dépasse l'extrémité des rectrices suivantes dans la *L. gouldi*. Les rectrices de la deuxième paire sont noires jusqu'au bout des suivantes ; tandis que dans l'oiseau de la Colombie elles sont vertes beaucoup plus loin. Les oiseaux en plumage de

transition présentent également la même différence dans la coloration de la queue. Le vert du plumage du corps est moins pur dans les oiseaux péruviens, c'est à dire qu'il tire plus fort sur le doré. Les subcaudales sont vertes au milieu et largement bordées de fauve isabelle.

\*15. *RAMPHOMICRON RUFICEPS* (Gould).

Trois mâles et deux femelles de Cutervo, recueillis en décembre, janvier et mai.

Le rabat gulaire dans le mâle est d'un beau vert dans sa moitié supérieure, et ce n'est que depuis ce point qu'il passe graduellement en doré et ensuite en cuivreux à l'extrémité même.

Les femelles n'ont rien de cendré en dessous, elles ont la gorge rousse-claire, parsemée de gros points verts; la poitrine fauve-roussâtre; le milieu de l'abdomen blanchâtre, lavé de fauve isabelle.

16. *RAMPHOMICRON MICRORHYNCHUM* (Boiss.).

Sept mâles en différents plumages de Cutervo à 9600-9800 pieds d'altitude, recueillis en novembre et en décembre.

17. *METALLURA SMARAGDINICOLLIS* (Orb. et Lafr.).

Cinq mâles tués à Cutervo à 9000 pieds d'altitude, recueillis en novembre et en décembre.

18. *ADELOMYIA MELANOGENYS* (Fras.).

Un mâle de Cutervo, tué le 25 novembre 1878.

\*19. *AGLEACTIS CUPREIPENNIS*, var. *PARVULA*, Gould.

Plusieurs exemplaires des deux sexes, tués à Cutervo entre le 22 novembre et le 12 février.

Considérablement plus petit que le *A. cupreipennis* de la Colombie, et distinct surtout par le bec beaucoup plus court.

Le mâle a son collier roux interrompu au cou; le bas du dos d'un rouge violacé très-brillant, de plus en plus clair au croupion, et passant graduellement en jaunâtre doré sur la partie postérieure du croupion, et en vert clair sur les tectrices caudales, qui changent en bleuâtre sous certain jour. Les rectrices sont plus largement bronzées à l'extrémité que celles des oiseaux de la Colombie.

Les femelles adultes ont le collier roux non interrompu; le bas du dos et le croupion semblable à celui du mâle, mais à couleurs un peu moins brillantes, moins étendues sur les côtés, et pas aussi uniformes à cause de la couleur sombre ou roussâtre de la base des plumes, plus ou moins visible parmi les espaces brillantes.

Les femelles plus jeunes ont seulement les tectrices caudales brillantes, et roses au lieu de verts.

♂. Longueur de l'aile 82 mm., queue 45, bec depuis la commissure 20. ♀. Longueur de l'aile 75-77 mm., queue 43, bec depuis la commissure 19.

20. *URANOMITRA CYANICOLLIS* (Gould); Elliot, Classif. and Synops. Troch. p. 198.

*Leucolia pelzelni*, Tacz. P. Z. S. 1879, p. 239, ♀.

Plusieurs exemplaires des deux sexes de Callacate, recueillis en mars, avril et mai.

La femelle diffère du mâle par le manque complet du bleu sur la tête et la nuque, qui est remplacé de vert et de grisâtre au front; du reste elle lui ressemble en tout, elle a même les côtés du cou également tachetés de vert bleuâtre brillant, mais d'une manière moins dense, surtout sur la région auriculaire; le vert des parties supérieures du corps un peu plus cuivreux, ainsi que celui des rectrices médianes; l'extrémité des rectrices externes et submédianes plus clair-gris sans éclat métallique. Taille presque la même.

21. *THAUMASIUS TACZANOWSKII*, Scl. P. Z. S. 1879, p. 146.

Six mâles et cinq femelles de Callacate, recueillis dans la même époque que les précédents.

La femelle ressemble en tout au mâle et présente même les mêmes dimensions.

22. *AMAZILIA LEUCOPHÆA*, Reichb.

Une paire de Callacate, du 12 mars et du 13 mai 1879.

Parmi les différentes observations que M. Stolzmann m'a communiqué sur les habitudes des Oiseaux-Mouches, il dit qu'il a souvent remarqué que certaines espèces ont l'habitude de s'accrocher aux troncs et aux grosses branches d'arbres à la manière des Pics, en se servant également de leur queue pour s'appuyer sur leur surface. Dans cette position ils restent plus ou moins longtemps et enfonce leur bec dans des fentes d'écorce épaisse, certainement à la recherche d'insectes et des larves qui s'y trouvent. Il a vu un *Aglæactis parvula* accroché de cette manière à une grosse branche et faisant une pareille exploration dans un trou profond.

#### STEATORNITHIDÆ.

\**STEATORNIS CARIPENSIS*, Humb.

Plusieurs exemplaires recueillis le 4 juillet 1879 dans la grotte de Ninabamba, située dans le département de Cajamarca, province de Chota, district Santa Cruz, sur le versant occidental des Cordilières. Altitude 7100 pieds au dessus du niveau de la mer, la grotte est plus bas, à peu près 6700. Au fond de la grotte traverse la rivière Chancay, qui prend le nom de Rio de Lambayaque, près de son embouchure, une des plus grandes rivières péruviennes, se rendant au Pacifique.

"Dans leurs intestins j'ai trouvé des fruits, appartenant au moins à trois espèces du genre *Nectandra* (selon M. Raimondi), qui servent de nourriture à ces oiseaux, et dont les noyaux sont ensuite rejetés intacts. Quelques-uns de ces noyaux poussent au fond de la grotte."

"Iris noir avec une fine bordure brune-foncée; pattes carnées tachetées çà et là de violet; ongles gris."

## PICIDÆ.

## 1. CHLORONERPES CALLONOTUS (Waterh.).

Une paire tuée à Chepen le 25 et le 26 septembre 1878. Ces deux exemplaires sont également ondulés de foncé sur les parties inférieures du corps comme les oiseaux de Tumbes.

## 2. CHLORONERPES FUMIGATUS (d'Orb. et Lafr.).

Trois femelles tuées à Callacate et à Cutervo le 9 décembre 1878 et le 31 mars 1879. Iris brun-foncé.

## \*3. CHRYSOPTILUS ATRICOLLIS (Malh.).

Mâle adulte de Callacate, tué le 25 avril 1879. Iris cerise-brunâtre-foncé. Un jeune de Cutervo, enlevé du nid en février de la même année.

Le premier plumage diffère de celui des adultes en ce que toutes les plumes plombées du devant et du milieu du sommet de la tête sont terminées d'une bordure rouge; le rouge de la nuque est moins intense et tirant sur l'orangé; les raies claires dorsales sont beaucoup plus foncées et olives; les raies claires de la poitrine moins pures; le milieu du ventre tacheté de noirâtre. Iris brun-foncé.

## 4. HYPOXANTHUS BREVIROSTRIS, Tacz.

Un jeune mâle au point de changer son premier plumage, tué à Cutervo le 4 janvier 1879, diffère peu des adultes, et principalement par le rouge moins intense et moins uniforme sur les parties supérieures du corps, surtout au sommet de la tête, où les raies noires précédentes l'extrémité rouge des plumes y forment des nombreuses bandes transversales; une raie noire, s'élargissant de plus en plus en arrière, borde de chaque côté le rouge du sommet de la tête; le jaune des parties inférieures du corps est plus pâle et moins pur. Iris cerise-brunâtre-foncé.

## \*5. COLAPTES STOLZMANNI, n. sp.

*C. rupicola*, Sci. P. Z. S. 1878, p. 170.

*Pileo mystacibusque plumbeo-schistaceis; loris, genis, gula pectoreque pallide cinnamomeis; collo infero subtiliter nigro translineato; dorso alisque brunneo fulvoque transfasciatis; abdomine, uropygio subalaribusque flavis; cauda nigricante, rectricibus externis flavido transfasciatis; scapis remigum totis rectricumque basi luteis.*

♂. *Long. alæ 178, caudæ 135, rostri 56, tarsi 32 mill.* ♀. *Long. alæ 178, caudæ 130, rostri 58, tarsi 32 mill.*

♂. Sommet de la tête et moustaches plombés ardoise, l'extrémité même de ces dernières rouge sur un espace très-petit; lores, tour des yeux, côtés de la tête, ainsi que du cou et la gorge d'un roux cannelé clair, passant en une nuance plus ou moins jaune de serin sur l'abdomen et les sus-caudales; la moitié inférieure de la gorge traversée d'une quinzaine de lignes noires. Dos et ailes bruns-foncés,

traversés de nombreuses lignes fauves-roussâtres, de moitié plus fines que les foncées; croupion et les sus-caudales de la couleur de l'abdomen; les tectrices les plus longues traversées de quelques raies noires. Rémiges brunes-foncées, à tige jaune; quelques raies fauves sur la barbe externe, le bord de l'interne largement jaune dans les primaires jusqu'à la moitié de leur longueur, et rayé jusqu'au bout des plumes dans les secondaires; subalaires jaunes. Queue noire-olivâtre an-dessus et noire an-dessous, à base de toutes les rectrices plus ou moins jaunâtre et tige jaune; les externes rayées irrégulièrement de roussâtre sur la page dorsale, et fort colorées de jaune sur l'inférieure. Bec plombé, plus foncé à l'extrémité; pattes jaunâtres; ongles jaunâtres sur les côtés et d'un corné foncé au dos; iris jaune-citron.

♀. La femelle diffère seulement par le manque du rouge sur l'extrémité des moustaches.

Jeune oiseau en premier plumage semblable aux adultes et ne diffère que par le schistacé du sommet de la tête plus foncé; le cannelle des côtés du visage et du haut de la gorge moins intense et moins pur; le bas de la gorge également rayé en travers; les nuances des parties inférieures du corps également disposées comme dans les adultes, mais les raies claires dorsales sont moins pures et imprégnées d'une nuance grisâtre; extrémité des rémiges terminée d'une bordure fauve; la première et la deuxième rectrice rayées de jaunâtre; tectrices caudales rayées beaucoup plus fort de foncé que dans les adultes. Extrémité du bec blanc; iris cendré.

Les œufs, trouvés en février, ont l'éclat aussi fort que ceux du *Gecinus viridis*. Dimensions:  $32.8 \times 24.3$ ;  $32.8 \times 24.5$  mm.

Un mâle adulte et quatre femelles recueillis à Cutervo depuis le 17 décembre 1878 jusqu'au 12 janvier 1879; un jeune pris dans le nid le 7 janvier.

#### ALCEDINIDÆ.

CERYLE CABANISI (Tsch.).

Un mâle tué à Chepen en septembre 1878. Iris brun-foncé.

#### TROGONIDÆ.

TROGON COLLARIS, Vieill.

Un mâle tué le 15 novembre 1878 à Cutervo à 9900 pieds d'altitude. Iris brun-foncé; tour des yeux corail; bec orangé.

#### CUCULIDÆ.

\*1. DIPLOPTERUS NÆVIUS (Gm.).

Trois mâles et un jeune oiseau de Callacate, tués dans les derniers jours de mars et à la fin d'avril 1879. Iris brun-noisette-clair dans les adultes et gris dans le jeune.

2. CROTOPHAGA SULCIROSTRIS, Sws.

Des œufs de Cutervo.

## PSITTACIDÆ.

1. *CONURUS MITRATUS*, Tsch.

Un exemplaire de Cutervo à 10,000 pieds d'altitude, tué le 11 décembre 1878. Iris composé de deux anneaux, dont l'externe est d'un jaune sale clair et l'interne gris-pâle.

2. *BOLBORHYNCHUS AURIFRONS* (Less.).

Un mâle tué à Callacate le 22 mai 1879. Iris brun-foncé. Tout le dessous de cet exemplaire est vert, excepté une touffe de plumes jaunes sur les côtés de la poitrine, tandis que dans les mâles des environs de Lima la poitrine et l'abdomen sont largement jaunes.

3. *PSITTACULA CŒLESTIS* (Less.).

Un mâle tué à Chepen le 23 septembre 1879. Iris brun-foncé.

## FALCONIDÆ.

1. *ACCIPITER BICOLOR* (Vieill.).

Un mâle de Cutervo à 9700 pieds d'altitude, tué le 6 décembre 1879. Iris ainsi que la peau nue du tour des yeux jaunes; pattes orangées. Cet exemplaire a comme le *A. chilensis* la poitrine et la gorge fort colorés de blanc.

2. *ACCIPITER ERYTHROCNEMIS*, Schl.

Un jeune mâle pris à Cutervo au moi de mars 1879. Iris jaune.

3. *URUBITINGA UNICINCTA* (Temm.).

Une jeune femelle tuée à Cutervo le 14 janvier 1879.

## STRIGIDÆ.

\*1. *BUBO MAGELLANICUS*, Gm.

Une femelle de Cutervo, tuée le 27 janvier 1879. Iris jaune.

Cette femelle présente la coloration semblable à celle d'un mâle fourni par M. Jelski de la Guyane française en 1868, mais elle en diffère principalement par le blanc du collier beaucoup plus répandu et occupant le menton et le bas du visage; ce collier est partagé en deux par une bande foncée continue, qui fait la continuation des bandes noires postauriculaires; les plumes de touffes nasales sont beaucoup plus blanches. Dans l'exemplaire de Cayenne cité plus haut le menton est foncé comme dans le *B. virginianus*. Cette femelle diffère aussi par les pattes moins fortes, et surtout par les doigts beaucoup plus courts: le médian sans ongle est long de 70 mm., tandis que celui de l'oiseau de Cayenne est de 77 mm.; les pattes sont plus velues que dans ce dernier, la surface dorsale des doigts est parfaitement couverte de plumes jusqu'au bout, tandis que dans celui de Cayenne les plumes ne la couvrent pas en entier et laissent la dernière phalange presque nue. Le bec est moins fort que dans l'oiseau de Cayenne, à crochet moins prolongé. Les ongles sont aussi moins forts.



En général l'oiseau de Cayenne ressemble au péruvien par la coloration, excepté le haut du collier ; par la force des pattes, la longueur des doigts et la force des griffes il ressemble à l'oiseau de Canada avec lequel je l'ai comparé, mais il en diffère par les doigts beaucoup moins garnis, et par la couleur générale.

## 2. STRIX PERLATA, Licht.

Une femelle de Cutervo du 21 janvier 1879. Iris presque noir.

## ANATIDÆ.

### QUERQUEDULA OXYPTERA (Meyen).

Une paire de Cutervo du 3 décembre et du 14 janvier 1879. Iris brun-foncé.

## ARDEIDÆ.

### TIGRISOMA SALMONI, Schl. et Salv.

Deux jeunes oiseaux en premier plumage, tués à Callacate en mai 1879. Iris jaune.

## COLUMBIDÆ.

### 1. LEPTOPTILA RUFAXILLA (Rich. et Bern.)?

Deux femelles tuées à Cutervo à 9800 pieds d'altitude, à la fin de novembre 1878 et en février 1879. Iris orangé-brunâtre à l'extérieur, et d'un brun-grisâtre très-foncé autour de la pupille, se confondant presque avec cette dernière.

Ces deux femelles présentent la coloration bien différente de celle des oiseaux de la Guyane et d'un mâle de Monterico au Pérou central, recueilli en 1870 par M. Jelski. La couleur générale du dos est d'un gris foncé un peu olivâtre, sans aucune nuance rousse, propre aux oiseaux cités plus haut ; la couleur de la poitrine et des côtés de l'abdomen est d'un rose plus pâle et moins pur, sans aucune trace de nuance roussâtre sur la surface médiane des plumes, et qui est la plus répandue sur l'oiseau de Monterico ; elles n'ont point de cendré au sommet de la tête, remplacé par un gris un peu rougeâtre ; point de nuance lilacée au cou où il y a un petit espace d'éclat verdâtre à la naissance du dos ; les côtés du visage n'ont point de roux, caractéristique dans l'espèce, remplacé par une couleur analogue à celle des parties inférieures du corps. L'aile est plus courte de 12 mm. et en conséquence la queue paraît être plus longue ; les rectrices latérales beaucoup moins larges, atténuées à l'extrémité, et bordées dans toute leur longueur d'une fine bordure blanche.

Les œufs, recueillis en avril et en mai, présentent des différences assez grandes dans leurs dimensions, et dans la forme générale ; les uns sont assez allongés et minces, tandis que les autres beaucoup plus courts et gros ; les uns sont régulièrement elliptiques, tandis que les autres ovés ; le blanc des uns est pur, tandis que dans d'autres il est jaunâtre. Dimensions :  $29 \times 22.2$  ;  $29.5 \times 24$  ;  $31 \times 23$  ;  $31 \times 24$  ;  $32.5 \times 24$  ;  $33 \times 23$  mm.

## 2. ZENAIDA AURICULATA (Gay).

Un mâle tué à Cutervo le 25 janvier 1879. Iris presque noir.

## 3. GEOTRYGON FRENATA (Tsch.).

Un mâle de Cutervo, tué le 20 février 1879. Iris jaune-brunâtre.

## 4. COLUMBULA CRUZIANA (Knip et Prév.).

Des œufs recueillis à Callacate dans les premiers jours de juin.

## RALLIDÆ.

RALLUS CÆSIUS, Tsch. Faun. Per. Aves, p. 300.

*Rallus rythyrhynchus*, Tacz. P. Z. S. 1874, p. 559.

Deux mâles et deux femelles de Cutervo, tués en décembre 1879. Tous ces exemplaires, ainsi que ceux des environs de Lima et de Junin, ont le menton et le devant de la gorge, comme le dit Tschudi, gris-foncé très-peu distinct de la couleur plombée générale de tout le dessous du corps; les subcaudales noires largement bordées de fauve-roussâtre. Le bec est selon M. Jelski olive-verdâtre, avec une grande tache latéro-basale rouge-foncée, occupant le côté de la mandibule inférieure et le bord de la supérieure; le dos dans la naissance du bec bleu clair, et l'extrémité de la mandibule inférieure plus ou moins jaune. L'iris dans tous ces exemplaires est indiqué rouge, tandis que dans la description de Tschudi il est dit "gris." Pattes rouges-jaunâtres.

♂. Longueur de l'aile 144 mm., queue 70, bec 52. ♀. Longueur de l'aile 130-134 mm., queue 69, bec 47-50.

## SCOLOPACIDÆ.

GALLINAGO ANDINA, Tacz. P. Z. S. 1874, p. 361.

Deux mâles de Cutervo, tués le 2 décembre 1878 et le 14 janvier 1879.

## TINAMIDÆ.

\*NOTHOPROCTA CURVIROSTRIS, Schl. et Salv. Nomencl. Av. Neotr. p. 163.

Cinq exemplaires des deux sexes, tués à Cutervo à 9000 pieds d'altitude, en décembre et en janvier, et un poussin de quelques jours pris au mois de mars.

Comparés par Mr. Sclater avec l'exemplaire typique. La description citée est trop courte; comme la coloration de toutes les Nothoproctes est fort compliquée et souvent peu différente entre les espèces, la détermination n'est pas toujours facile, je donne donc une description détaillée, faite d'après les oiseaux de M. Stolzmann.

Sommet de la tête couvert de plumes noires, largement entourées de roussâtre sale, et varié de quelques stries longitudinales blanchâtres. Les plumes du côté postérieur du cou brunes-foncées au milieu, largement entourées d'une bordure fauve sur les côtés et

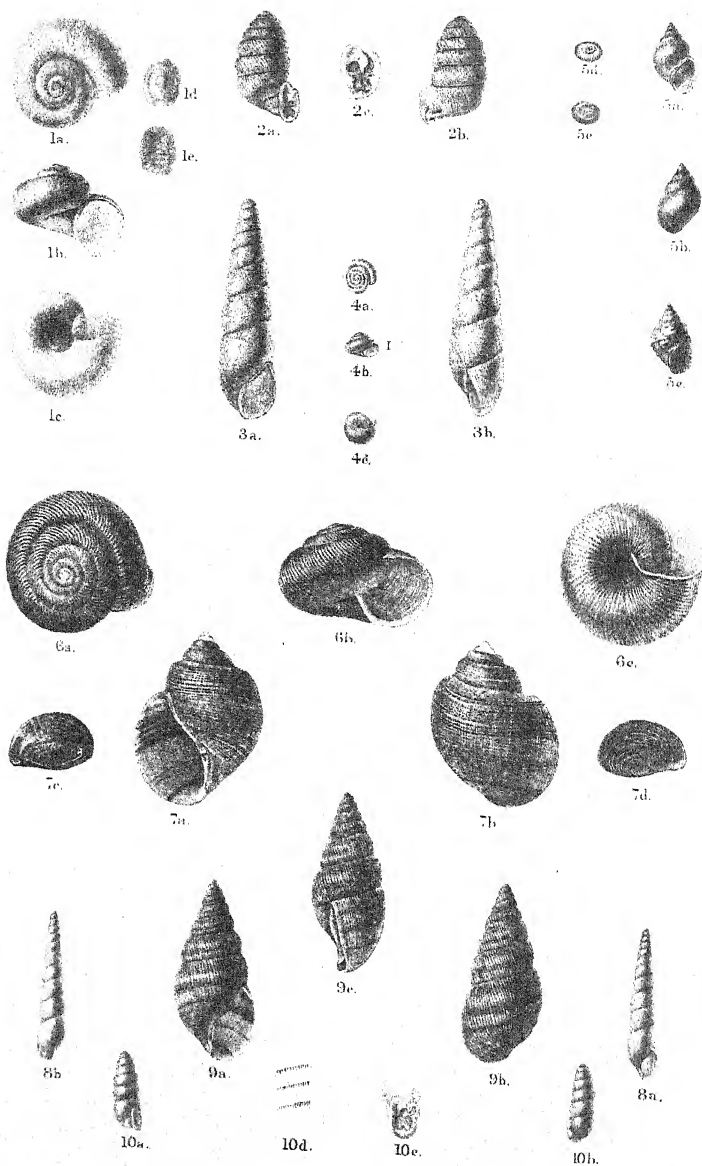
roussâtre à l'extrémité; toutes les plumes du dos sont noires au milieu, avec deux stries longitudinales blanchâtres sur les côtés; une large bordure fauve sale tachetée de noirâtre au milieu, en laissant une fine ligne uniforme terminale et une autre pareille du côté opposé de cette bordure, et deux ocelles sur le milieu de la plume, dont celles du devant sont petites, et de plus en plus grandes et plus compliquées en avançant vers les parties postérieures du corps. Le menton est fauve pale unicolore; les côtés du visage fauves, tachetés de noirâtre; devant de la gorge, poitrine et flancs de l'abdomen sont d'un roux plus ou moins intense et vif; le haut de la gorge varié de stries ou de petites taches noirâtres, et d'autres taches fauves plus grandes; les taches fauves s'élargissent sur la poitrine et les flancs en bandes transversales, plus ou moins distinctes et régulières, bordées chacune sur la poitrine des deux côtés d'une fine ligne brunâtre, plus ou moins distincte; le milieu du ventre et les jambes sont fauves unicolores; sus-caudales largement rayées de blanchâtre, de noir et de gris roussâtre sale. Tectrices alaires roussâtres sales, barrées transversalement de noir, et parsemées de grosses gouttes fauves, plus ou moins arrondies; la barbe externe des primaires rayée en travers de fauve blanchâtre et de brun; celle des secondaires d'un roux ferrugineux vif, rayée de brun noirâtre; les tertiaires sont d'une coloration plus analogue à celle du dos et d'un dessin compliqué; la barbe interne de toutes les rémiges grise-brunâtre, uniforme dans les primaires et rayée de roussâtre dans les secondaires; petites tectrices sous-alaires rousses, les grandes de la couleur de la page interne des rémiges avec quelques raies roussâtres. Bec brun-noirâtre, à base de la mandibule inférieure jaunâtre; pattes jaunes sales, avec les ongles de la même couleur; iris brun-grisâtre, plus foncé autour de la pupille et plus clair à l'extérieur.

Les deux sexes ne présentent aucune différence; il paraît même que les deux sont sujets aux mêmes variations de leur coloration, qui consistent principalement en nuance rousse plus ou moins intense sur le dessous du corps, ou plus ou moins faible et passant en fauve; en raies claires pectorales plus ou moins prononcées et régulières; en taches gutturales plus ou moins nombreuses, et en nuance des bordures dorsales plus roussâtre ou plus grisâtre.

♂. Longueur de l'aile 165 mm., bec 35, tarse 38, doigt du milieu avec l'ongle 37. ♀. Longueur de l'aile 175 mm., bec 38, tarse 42, doigt du milieu avec l'ongle 40.

Le poussin a le front, les côtés du visage et tout le dessous du corps fauve; le front varié de noirâtre et les joues des deux lignes noires, dont une commence au bord postérieur de l'œil et passe le long des côtés du cou, et l'autre forme une moustache en prenant la naissance à la commissure; sommet de la tête brun varié d'extrémités du duvet rousses; dos également comme celui des adultes, strié de blanchâtre et varié irrégulièrement de roux; ailes semblables à celles des adultes, mais les tectrices largement entourées de roussâtre sans taches fauves; la page externe des rémiges secondaires





A. F. S. 1880. 101

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NEW SHELLS FROM EAST AFRICA AND NOSSI-BÉ P.

d'un roux moins intense. Bec noirâtre, à mandibule inférieure beaucoup plus claire que dans les adultes; pattes jaunâtres-pâles; iris brun-foncé.

Les œufs, trouvés dans les premiers jours de juin, sont allongés et elliptiques, à surface fort polie, d'une belle couleur violette grisâtre, semblable à celle du chocolat au lait. Dimensions:  $54 \times 38$ ;  $55 \times 38$ ;  $55 \times 37.5$ ;  $55.5 \times 37.3$ ;  $56 \times 37.6$  mm.

2. Description of three new Species of Land and Freshwater Shells from Nossi-Bé Island (N.W. Coast of Madagascar). By ALFRED E. CRAVEN, F.R.G.S., F.G.S., F.L.S., F.Z.S., &c.

[Received March 1, 1880.]

(Plate XXII.)

To the molluscan fauna of Nossi-Bé Island I have three new species to add:—

*ACHATINA MAMILLATA*, sp. nov. (Plate XXII. fig. 8.)

Shell elongated, semitransparent, very pale greenish yellow, faintly striated by the lines of growth; apex mamillated and rounded; spire produced; whorls 11, very gradually increasing, rather convex; aperture semilunar, labrum thin and simple; columella rather arcuate; generic fold small; suture deep and much puckered beneath, excepting round the apical whorls, where it is coarsely dentated.

Dimensions:—Length 19 to 21 millims., diameter of last whorl 4.5, height of aperture 4, breadth of aperture 2.5.

*Locality.* Nossi-Bé Island, under dead leaves in woods near the sea-shore.

*PUPA CAFEICOLA*, sp. nov. (Plate XXII. fig. 10.)

Shell subrimate, elongated, semitransparent, rather glossy, of a pale yellowish-white colour, faintly obliquely striated, especially the last whorl; apex rounded and obtuse; whorls 7, convex, gradually increasing, the penultimate whorls being the broadest; the last whorl not descending, but straightened a short distance from the aperture; aperture irregularly semioval, armed with three teeth, viz. a thin lamelliform tooth on the paries connected with the labrum at its upper margin, a broad-based tooth on the labrum also reaching the margin, and a small tooth at the base of the columella within the aperture; columella straight, furnished far within the aperture with a lamelliform expansion; deep depressions or pits on the exterior of the shell correspond with the teeth on the labrum and base of aperture; labrum very slightly thickened, expanded and somewhat reflexed; suture coarsely dentated.

Dimensions:—Length 5·6 millims., diameter of last whorl 2, height of aperture 1·2, breadth of aperture 1.

*Locality.* Nossi-Bé Island, in coffee-plantations.

*PALUDINA COLBEAUI*, sp. nov. (Plate XXII. fig. 5.)

Shell turbate, perforate, opaque, dark greenish black, coarsely striated by the lines of growth; apex obtuse, spire acuminate; whorls 6, very convex, the last occupying about two thirds of the entire shell, the upper ones tabulated; interior of shell of a pale neutral tint; labrum thin, simple, of a brown colour; columella arcuate and somewhat reflexed over the umbilicus; basal margin of the aperture slightly effuse and angular; umbilicus small but well defined; suture simple.

Operculum corneous, black, pyriform and concentric; nucleus subcentral.

Dimensions:—Length 11 millims., diameter of last whorl 6, height of aperture 5·5, breadth of aperture 4.

*Locality.* Nossi-Bé Island, in a sluggish stream running through coffee-plantations.

I name this species after my friend M. Jules Colbeau, of the Société Malacologique de Belgique.

3. On a Collection of Land and Freshwater Shells made during a short Expedition to the Usambara Country in Eastern Africa, with Descriptions of seven new Species. By ALFRED E. CRAVEN, F.R.G.S., F.L.S., F.G.S., F.Z.S., &c.

[Received March 1, 1880.]

(Plate XXII.)

*HELIX MOZAMBICENSIS*, Pfr. P. Z. S. 1855, p. 91, pl. 31. fig. 9.

Very plentiful at Pangani, Marongo, and Magila.

*HELIX USAMBARICA*, sp. nov. (Plate XXII. fig. 6.)

Shell depressedly turbate, umbilicate; apex obtuse, spire depressed; whorls 6, gradually increasing; the upper ones rather convex and the last very convexly rounded and not descending; the two apical whorls smooth, the next three obliquely and the last flexuously lirate; epidermis very glossy, of a rich brown above, and of a paler brown beneath; shell beneath epidermis nearly white; interior of shell of a pale purplish white; aperture semilunar, as broad as high; labrum thickened and slightly reflexed; columella somewhat straightened obliquely; suture deep and well marked; umbilicus very deep and large.

The young shells are very thin, glossy and transparent.

Dimensions :—Greatest diameter 24 millims., smallest diameter 20, height from base of aperture to apex 15, breadth and height of aperture 11.

*Locality.* Magila, at the foot of the Usambara hills, in thick woods near a waterfall.

This species has more the appearance of some of the North-American forms than of the African.

*HELIX ZANGUEBARICA*, sp. nov. (Plate XXII. fig. 4.)

Shell conically turbinate, perforate, transparent, smooth, and of a uniform dark brown colour; apex obtuse, spire rather depressed; whorls  $4\frac{1}{2}$  to 5, all convex, the last as broad as the remainder together; aperture ovately lunate, broader than high; labrum sharp and simple, excepting near the umbilicus, where it is slightly reflexed outwardly; suture deep and well defined; umbilicus very small.

Dimensions :—Greatest diameter 3 millims., smallest diameter 2·7, height from base of aperture to apex 2·4, breadth of aperture 1·4, height of aperture ·9.

*Locality.* Magila, on decaying vegetation. Mr. J. S. Gibbons found some dead specimens on Zanzibar Island.

*BULIMUS KIRKII*, Dohrn, P. Z. S. 1865, p. 232.

*Locality.* Magila, in woods.

The specimens collected are rather larger than those in the British-Museum collection.

*BULIMUS PUNCTATUS* (Anton), Verz. p. 42. no. 1540; Reeve, Conch. Icon. no. 452, pl. 65.

Very plentiful at Pangani and Marongo.

*BULIMUS OVOIDEA*, Brug. Enc. Méth. i. p. 335. no. 64; Küster, Icon. Moll. (*Pupa*) p. 120, pl. 16. figs. 2, 3.

Several fine specimens in woods, Magila.

*BULIMUS OBESUS* (Gibbons, MS.), Quart. Journ. of Conch. vol. i. p. 255, pl. ii. fig. 3.

This species closely resembles *Bulimus ovoides* (Brug.), but is of much smaller size.

*Locality.* Magila and Pangani. Dr. Kirk took a living specimen at Magila; the animal was of a pale green colour, visible through the shell.

*BULIMUS MAGILENSIS*, sp. nov. (Plate XXII. fig. 3.)

Shell turriform, subtransparent, solid, very glossy, showing the lines of growth very plainly, of a pale olive-brown colour, rather lighter near the apex; apex large and obtuse, spire elongated; whorls 9 to 10, very slightly convex and gradually increasing; aperture pyriform, occupying rather less than one sixth of the entire length of the shell; labrum simple, columella somewhat oblique and



faintly reflexed; suture very deep but narrow, slightly puckered at its edges.

Dimensions:—Length 30 to 35 millims., breadth of last whorl 9, height of aperture 7, breadth of aperture  $4\frac{1}{2}$ .

*Locality.* Magila, under moss growing on rocks.

*ACHATINA KIRKII*, sp. nov. (Plate XXII. fig. 9.)

Shell turritiform, obliquely lirata, of a yellowish-brown colour, sometimes marked with chocolate-coloured spiral bands; epidermis glossy; apex very obtuse; spire rather elongated; whorls  $7\frac{1}{2}$ , convex, the last occupying rather more than one third of the entire length of the shell; labrum thin, simple; columella obliquely curved; the generic fold small, but well defined; suture deep.

Dimensions:—Length 26 millims., breadth of last whorl 12, height of aperture 10, breadth of aperture 6.

*Locality.* Magila, along with *Helix usambarica*, in woods near a waterfall, scarce.

I have great pleasure in naming this species after Dr. Kirk, H.M. Consul-General in Zanzibar.

*PUPA USAMBARICA*, sp. nov. (Plate XXII. fig. 2.)

Shell pupiform, rimate, gibbose, strongly obliquely lirata; apex obtuse; whorls 8, very convex, narrow, gradually increasing, the sixth being the broadest and the last slightly detached and a little produced; aperture small, armed with six teeth; a large thin lamellar tooth extending some distance within the shell, at the centre of the upper margin; three teeth, of which the centre one is the largest, on the labrum or outer lip; a small and narrow internal lamellar tooth a little below the centre of the labrum; a broad bifid tooth on the columellar margin; none of these teeth, with the exception of the one on the upper margin, reaches the margin of the aperture; on the exterior of the last whorl are small depressions or pits corresponding with the teeth; labrum entire, expanded and somewhat reflexed; suture well defined.

Dimensions:—Diameter of sixth whorl 6 millims., greatest diameter of last whorl 7, smallest diameter of last whorl 5, height from base of aperture to apex 11, height of aperture 4, breadth of aperture  $3\frac{1}{2}$ .

*Locality.* Magila; rare.

*CYCLOSTOMA ZANGUEBARICUM*, Petit, Journ. d. Conch. vol. i. p. 53, pl. iii. fig. 6.

*Locality.* Pangani, Marongo, and Zanzibar; very abundant round the roots of shrubs and trees.

*CYCLOPHORUS MAGILENSIS*, sp. nov. (Plate XXII. fig. 1.)

Shell depressed, subdiscoid, umbilicated, striated by fine lines of growth, glossy, of a yellowish-brown colour; apex flattened and very obtuse; whorls 4, very convex and rapidly increasing, the last slightly descending near the aperture; aperture circular; labrum

thin, entire, very slightly reflexed outwardly near the umbilicus; umbilicus very large and deep; suture very deep; operculum normal, of a dark-brown colour.

Dimensions:—Greatest diameter 12 millims., smallest diameter  $10\frac{1}{2}$ , height from base of aperture to apex 9, diameter of aperture 5.

*Locality.* Magila, in woods.

LANISTES FARLERI, sp. nov. (Plate XXII. fig. 7.)

Shell turbate, sinistral, imperforate, globose; colour varying from olive-green to brownish black, irregularly and coarsely spirally striated and ornamented with numerous spiral bands of various colours, chiefly sienna and purple; lines of growth very apparent and together with the spiral striæ giving the shell a subgranose appearance; whorls  $4\frac{1}{2}$  to 5, very convex and somewhat tabulated above; aperture semilunar; labrum thin, simple; columella oblique, with a faint subtruncation near its base; operculum thin, deep brownish black; muscular scar large.

Dimensions:—Greatest diameter 21 millims., smallest diameter 17, height from base of aperture to apex 25, height of aperture 16, breadth of aperture 10.

*Locality.* Magila, exceedingly numerous in a stream of running water.

I associate this shell with the name of the Rev. J. Farler, of the Universities Mission station at Magila.

MELANIA FERRUGINEA, Lea, P. Z. S. 1850, p. 182; Reeve, Con. Icon. xxi. sp. 147.

*Locality.* Umba (between Marongo and Magila), in an almost dried up watercourse.

MELANIA ZANGUEBARENSIS, Petit, Journ. d. Conch. vol. ii. p. 263, pl. vii. fig. 1.

A small variety.

*Locality.* Magila, together with *Lanistes farleri*; very abundant.

#### EXPLANATION OF PLATE XXII.

Fig. 1 a-c. *Cyclophorus magilensis*, p. 218.

2 a-c. *Pupa usambarica*, p. 218.

3 a, b. *Bulimus magilensis*, p. 217.

4 a-c. *Helix zanguebarica*, p. 217.

5 a-c. *Paludina colbeaui*, p. 216.

6 a-c. *Helix usambarica*, p. 216.

7 a-d. *Lanistes farleri*, p. 219.

8 a, b. *Achatina mamillata*, p. 215.

9 a-c. *Achatina kirki*, p. 218.

10 a-d. *Pupa cafeeicola*, p. 215.

## 4. On the Names to be applied to certain Echinoidea.

By F. JEFFREY BELL, B.A., F.Z.S.

[Received March 10, 1880.]

The tone which Prof. Agassiz has thought proper to adopt towards me makes any further discussion of the synonymy of the Echini impossible between us. It is, however, necessary that I should notify the Society of one or two matters lest my co-fellows should be led to think, from the accusations that have been brought against me, that I have been guilty of great disrespect towards it.

I am charged, first, with quibbling, and, secondly, with misrepresentation. In truth, however, the sentence which forms the basis for the first accusation is obviously a dialectic artifice, by means of which the chief point under discussion is thrown into sharper relief. That point is, of course, the necessity for starting with Linnæus in our nomenclature; whenever that salutary rule is disobeyed an author can hardly escape some pitfall, and into such a pitfall Prof. Agassiz has fallen.

While I owe to every author whom I may quote the utmost exactness in representation, I owe it no less to the Society who did me the honour to publish my paper, and to the student who reads it. I shall not so far forget my own dignity as to plead that I intended no misrepresentation; I will say at once that I have not been guilty of it, and that Prof. Agassiz does not support his accusation.

In criticizing the method of bibliographical reference adopted by the author of the 'Revision,' I directed attention to a misleading reference which stands thus:—"Int. Mon. Scut." This is now allowed to be an unfortunate method of quotation; but "it does not justify Mr. Bell in assuming that he corrects a grave error, and gives information not to be found in the Revision." Here I submit the following facts:—

(1) The following are the *contents* of the second livraison of the 'Monographies d'Echinodermes,' as published by Prof. Louis Agassiz—(a) Observations on the progress of the knowledge of the Echinodermata, and (β) the "Seconde Monographie. Des Scutelles." The Monograph consists of (i) a short preface, (ii) "Introduction. Du groupe des Scutelles en général," and (iii) a series of chapters on the different genera of the group.

Now which of these constituent parts is referred to by "Int. Mon. Scut.?" why, of course, as all the world but Mr. Bell knows quite well, the 'Observations . . .' are referred to! That there is an Introduction to the Scutellæ has, it is notorious, been at no time an obstacle to such a use of the abbreviated reference. That this is really the case should be obvious from Mr. Agassiz's statement—"All writers on Echinoderms who have quoted these independent monographs (as I have done in the 'Revision') without reference to the number of the Livraison, but entirely from the contents as printed on the cover, always quote this 'essay' as 'Monographie des Scu-

telles (Introduction).’ I have only followed their example and that of Prof. Agassiz himself.”

If by this Mr. Alexander Agassiz only means that those who do not quote it as the second livraison, quote it by its titlepage, I submit that such an answer is a mere trifling with the Zoological Society; but if he means that such is the ordinary method of referring to the ‘Observations’ &c., (and that he does mean or aim at meaning this is probable from his preceding statement that Prof. Louis Agassiz “invariably spoke of it as ‘l’Introduction de la Monographie des Scutelles’”) I can pass to

(2) *The mode of reference adopted by other writers.* Mr. Alexander Agassiz states that his father invariably spoke of it in one way; of course, as an answer, Mr. Agassiz means that there are printed references to the ‘Observations . . .’ in which the abbreviation adopted by himself in his ‘Revision’ is used. There may be such, but I am not acquainted with them, although *I can point to five genera in the ‘Nomenclator’ in which a different method of reference is adopted.* Let the reader turn to *Amblypneustes*, *Pleurechinus*, *Temnopleurus*, *Agarites*, or *Tetrapygyus*, and he will “invariably” find succeeding these names the expression “*Agass. Monogr. Echin. 2de livr. 1841.*” Turning now to other witnesses, I will call on two honoured names: one was, with Louis Agassiz, the author of the ‘Catalogue Raisonné,’ and he<sup>1</sup> writes *Monogr. d’Échinodermes*, 2e livre. p. 7; the other is Alex. Agassiz’s eminent compatriot A. E. Verrill, who (s. v. *Euryechinus*) writes, on p. 304 of his ‘Notes on the Radiata in the Museum of Yale College’ (1867), “Agassiz, *Monogr. d’Échinod. 2me livr. (Introduction), July 1841.*”

It is of no use to appeal to the ‘Catalogue Raisonné’ (1846, 1847), for the essay in question is not there referred to; nor is there, to my knowledge, any reference to it in such considerable authors as Lütken<sup>2</sup>, Von Martens, Perrier, or Dujardin and Hupé. The Society will now see how far Prof. Agassiz is justified in his term “all,” and in his adverb “invariably.”

(3) *Contents of the “Essay.”* Even now I am not certain that Mr. Alex. Agassiz and I are referring to the same paper. It is true that we both refer to an article published under the same cover as the Monograph of the Scutellidæ, that we both quote the title (‘Observations . . .’) in just the same way, and that we both find on a given page just the same generic names; and yet we differ completely as to its other contents and as to its aim. The basis of my contention obviously laid in the fact that I looked upon the ‘Observations’ as having a general interest, and as being, therefore, incorrectly denominated by the term “Int. Mon. Scut.”; we learn now, however, from unquestionable authority, that “the contents of this so-called essay, in spite of the heading, show plainly enough that it was not considered at the time as a special essay, but that it was simply an Introduction to the Livraison.” Now is the rest of

<sup>1</sup> Desor, ‘Synopsis des Echinides fossiles,’ p. 113.

<sup>2</sup> Save this, “1841 opstillede Agassiz (Præface) imidlertid en Række af Slaegter . . .” (Vidensk. Meddel. 1864, p. 154).

the livraison confined to the Scutellidæ? certainly it is, and Prof. Alex. Agassiz most explicitly says so; but what does the "so-called" Introduction deal with? In the space of 20 pages reference is made to (not to quote all) Forbes's 'British Starfishes' (itself a general work on Echinoderms), the classifications proposed by Müller and Troschel and by J. E. Gray for the Asterida, to M. Desmoulins's Studies on the Echinida, to Brandt's establishment of certain genera of *regular* Echini, to the same writer's classification of the Holothurians, to Grube's anatomy of *Sipunculus*, to Sars's researches into the development of *Asterias*, to J. Müller's labours on *Pentacrinus*, as well as to various memoirs on fossil forms.

(4) The genus *Tripneustes* is not defined in the essay referred to, but the type only mentioned as *E. ventricosus*.

(5) In the Introduction to Valentin's anatomy of *Echinus* the genus is well defined (p. viii).

(6) Notwithstanding certain cases to the contrary, I prefer to believe that, in the case of *Tripneustes* at any rate, L. Agassiz justly referred in the 'Nomenclator' to the paper in which he *amply defined* and so, strictly speaking, published that generic name.

There are two other statements of mine which it is not just to denounce as misrepresentations, for they both arise from my fundamental proposition that, in zoological nomenclature, names which antedate Linnæus do not exist; thus *variegata* gets put out of court, and 1788, not 1734, is, with me, the date of *unicolor*.

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April 6, 1880.

Prof. W. H. Flower, LL.D., F.R.S., President, in the Chair.

The Secretary read the following extracts from two letters of Mr. Arthur E. Brown, Superintendent of the Gardens of the Zoological Society of Philadelphia, U.S.A., relating to the birth of an Elephant, which had taken place on the 10th ult. in Cooper and Bailey's menagerie at Philadelphia. These letters had been addressed to Mr. W. A. Conklin, C.M.Z.S., of New York, and had been kindly communicated to the Secretary by that gentleman.

"The baby Elephant was born only on Wednesday morning; is a female, strong and healthy, and I see no reason why they should not successfully rear it. They have another female which they say is eight months gone with young; and from examination I am inclined to think this is the case.

"Our Prosecutor, Dr. Chapman, was fortunate enough to obtain the placenta in perfect condition; the only other one known, I believe, is an imperfect specimen in the Royal College of Surgeons, London, sent in spirit from India. It is a good thing that this one has fallen into perfectly competent hands. The baby is a lively, interesting little thing, about two feet high, weight 213 pounds (an hour after birth), and is well worth seeing.

"I send you with pleasure some measurements of the baby Elephant. The height and weight were taken an hour after birth, the others three days later. I have doubts of the accuracy of the weight, as it does not seem to me possible that it can weigh so much. There are several other measurements I wanted; but the young one was very uneasy, and the mother did not like the operation; so it was by no means an easy task to get any.

Weight .....	213 lb.
Height at shoulder .....	34½ inches
Length of forearm and manus .....	16 "
" hind limb .....	30 "
" lower leg and pes .....	16½ "
Girth at thorax .....	45 "
" abdomen .....	49 "
" fore foot. ....	17 "
Length of trunk .....	12 "
Girth at base of trunk. ....	9 "
Length of tail ....	20 "
Width between eyes. ....	8½ "
Distance between articulations of jaw, across ..	26 "

"The young one was up and walking about very shortly after birth, has teeth in both jaws, and sucks with the mouth. The mamma of the mother when distended projects somewhat laterally; so that the trunk of the young one is thrown up, and rests, while sucking, in the angle between the shoulder and thorax.

"Father and mother are each about twenty-three or twenty-four years old, and about the same size, some eight feet high, I should say.

"The proportions of the young one, to the eye, are nearly those of the adult; it is somewhat darker in colour; and the hairs are rather more plentiful about the forehead and shoulders. The mother shows much attachment for it.

"They have another female, which is undoubtedly with young by the same male—a further support of the theory that the reproductive faculties of the male, under domestication, are affected to a greater extent, or more commonly, than those of the female.

"The period of gestation in this case was just 629 days, from June 20, 1878, to March 10, 1880; she took the male some five or six times during several days.

"I see no reason now to doubt that they will successfully rear it. The show will be here for a month yet; and I shall watch the young Elephant with much interest."

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The following papers were read:—

## 1. On the Fishes of Afghanistan. By FRANCIS DAY, F.Z.S.

[Received April 6, 1880.]

In the 'Proceedings' of this Society for the year 1876 I was enabled to give an account of the fishes collected by the Yarkand expedition. Observing how little was known of the forms inhabiting the ranges of hills to the south and south-west of Peshawur, I applied to some friends in India to try and obtain collections. These ranges may be roughly classed into two:—the Sulimans, dividing the Punjab from Afghanistan proper; and the Beluchistan range or Halah Mountains, extending from near Kurrachee to Quetta. Up to the present I have not obtained any fishes from the Sulimans; and as no accounts of any captured there have, so far as I know, been recorded, it is impossible to give more than a guess as to whether their fish-fauna resembles that of the Himalayas or that of the Beluchistan range, which two, as I now find, are entirely distinct. Dr. C. Duke has been good enough to collect with great care and discrimination some of the fishes from the highlands about Kelat and Quetta, which I shall have to allude to further on. Col. Miles likewise sent me, in 1872, a small but beautiful collection from a river about twenty miles inland from Gwadar, on the Meckran coast; and what increases the interest of these two collections is that some of the fishes are identical species; so that we may fairly conclude that their range is extensive. I shall also allude to Griffith's collections, and one that I personally made on the eastern or Indian side of the Beluchistan range of hills.

The first account which we possess of the fishes inhabiting Afghanistan is by Griffith, whose collection was described by McClelland in the 2nd volume of the 'Calcutta Journal of Natural History.' Griffith, in his tour, collected fish at Loodianah, Ferozepore, also from streams existing in the watershed of the Indus, and likewise from that river itself so far south as near Shikarpoor; then proceeding through the Bolan Pass, he continued his investigations to Quetta, at which place the waters no longer find their way into the Indus, but become lost in detail, or empty themselves into the Helmund. His next researches were into the fishes of the Helmund and its affluents, as well as those of the Cabul river and its feeders until it finds its way past Jellalabad and through the Kyber Pass to Peshawur, and so on to the Indus. I do not intend making any remarks upon Griffith's researches in the Helmund or Cabul rivers, as at a future date we may hope to receive some more fishes from those localities.

The district I propose more especially drawing attention to is a range of hills stretching from the valley of the Indus, their most southern point being near Kurrachee; and in their course they divide Sind from Beluchistan. They tower one above another in steps, and are continued from the south on to Kelat and Quetta, the former being at an elevation of about 7000 feet with a European climate, while they decrease in height to Quetta, where they are

about 5900 feet, the slope of the latter place being, as observed, towards the Helmund.

Griffith's examples of fishes were, unfortunately, all or nearly all destroyed; but he had figures made, and determined them to be as follows:—in the Bolan Pass—*Barbus* (? *B. terio*), *B. tor*, *Opsarius* (? *Chela bacaila*), *Labeo diplostomus*, *Gonorhynchus* (? *Cirrhitina latia*), *Silurus kuggur*, ? *Macrogathus* (*Mastacembelus armatus*); from a stream at Gurmah flowing into that of the Bolan—*Barbus tor*, *B.* (? *B. terio*), *Gonorhynchus* (? *Cirrhitina latia*), *Systomus bimaculatus* (never described if new), *S. canius* (this cannot be *Barbus canius* = *B. gelius*, as the species does not extend so far, but it may be *B. ticto*); at Quetta he obtained a *Barbus* with bright red streaks (? *Scaphiodon microphthalmus*), two other Cyprinidæ (? *Scaphiodon irregularis* and *Barbus milesi*), a *Gonorhynchus* (? *Cirrhitina latia*), and a Loach (*Nemacheilus*).

Doubt may exist as to the identity of some of these species; but as my examples from Quetta agree in number with those discovered by Griffith, it does not seem improbable that we may be both alluding to the same forms. I will therefore now pass on to descriptions of such fishes as I have received from Gwadur in Beluchistan and the range of hills terminating at Quetta.

#### OPHIOCEPHALUS GACHUA, Ham. Buch.

Colonel Miles sent me some small examples from a river near Gwadur; it has likewise been recorded by Griffith that "two species of *Ophiocephalus* are found at Jellalabad which are unknown in Bengal." These two species were described as *Ophiocephalus indicus* and *O. montanus*, M'Clelland. Of the former, two examples, viz. from Loodianah and Seharanpore, exist in the British Museum, and are specimens of *O. punctatus*, which leads one to the conclusion that the Jellalabad fish was the same; while *O. montanus*, M'Clelland, is identical with *O. gachua*, the type (from Afghanistan) being stuffed and in the British Museum.

#### CALLICHOUS PABDA, Ham. Buch.

*Silurus anastomus*, Cuv. & Val. *S. lamghur*, Heckel. *Callichrous vittatus*, Swainson. *Cryptopterus latovittatus*, Playfair. *Callichrous egertonii*, Day.

My reasons for uniting these forms into one species I have fully detailed in my 'Fishes of India,' p. 479; and, admitting they are all identical, the range of the species is very wide: Griffith found one of this genus in Afghanistan; and such may have been identical with the beautiful example  $5\frac{1}{2}$  inches in length sent by Dr. Duke. Its pectoral spine is rather strong and serrated.

Griffith obtained from the Cabul river at Jellalabad an example of "a *Silurus* very like, if not identical with, the Pofteh." All the species of *Callichrous* are known as "Pofteh;" therefore it does not appear improbable that it may have been this form which was obtained at Jellalabad, especially as the river eventually finds its way into the



Indus, where this fish exists. M'Clelland, however, gives it as *C. checkra*, and Afghanistan and Punjab examples as identical. Two specimens were sent to Europe, one of which (young) is in the British Museum, and is *C. checkra*=*C. bimaculatus*, Bloch, but with a smooth pectoral spine, and may be the Afghan fish as labelled. If so, we have two species of *Callichrous* in Afghanistan.

*CIRRHINA LATIA*, Ham. Buch.

*Cyprinus gohama* and ? *sada*, Ham. Buch. *Barbus diplocheilus* and *Tylognathus barbatulus*, Heckel. *Gonorhynchus fimbriatus*, *macrostomus*, and *brevis*, M'Clelland. *Chondrostoma wattanah*, Sykes. *Crossocheilus rostratus*, Günther.

Among Dr. Duke's Quettah fishes are several of this species, but in a very bad state. There are three excellent examples sent by Colonel Miles from Gwadur,  $3\frac{1}{4}$ ,  $3\frac{1}{2}$ , and  $3\frac{3}{4}$  inches respectively in length. The upper lip is not so deeply indented as observable in some Himalayan examples; there is only a single pair of rostral barbels, and four and a half rows of scales between the lateral line and the base of the ventral fin.

This fish has much the appearance of a *Discognathus* (which is likewise termed *Gonorhynchus* by M'Clelland), adhering to stones in the beds of rivers, as I had an excellent opportunity of observing when investigating the fish-fauna of the Beluchistan range of hills. It is subject to numerous modifications; the rudiment of a pad is present behind the lower lip, in the situation where the sucker exists in *Discognathus*; while the two have the same proportions and the identical number of rays and scales. Consequently one being taken for the other is a not unlikely error. Still, as *D. lamta* is found from Syria to Abyssinia and through the Himalayas and India, it is to be supposed that it is present in Afghanistan.

*Cirrhitina latia* is very generally distributed from Sind throughout India, excepting south of the Kistna river and the Malabar coast. It is common along the Himalayas, where it attains as much as 8 inches in length. It now appears that it extends along the Beluchistan hills to Quetta, and also along the Meckran coast to Gwadur.

The genus *Scaphiodon* of Heckel appears to be well represented, as might have been anticipated, it being a Western Asiatic form which extends along the Meckran coast and the Beluchistan range of hills to the Punjab, Sind, and down the Malabar coast.

*SCAPHIODON IRREGULARIS*, Day.

This species I originally obtained in the Beluchistan range of hills, at an elevation of 3500 feet. Among Dr. Duke's fishes I find nine examples of it up to  $6\frac{1}{2}$  inches in length, thus giving me the opportunity of supplementing my original description. The pharyngeal teeth are plough-shaped, 4, 3, 2 | 2, 3, 4. The gill-rakers are short and somewhat wide apart. Pseudobranchiæ present.

## SCAPHIODON ACULEATUS.

*Chondrostoma aculeatum*, Cuv. & Val. xvii. p. 408.B. iii. D. 13 ( $\frac{3}{10}$ ). P. 15. V. 9. A. 3 | 7. C. 17. L. 1. 37. L. tr.  $7\frac{1}{2}$  | 5.

Length of head  $5\frac{1}{2}$ , of caudal fin 5, height of the body 4 times in the total length. *Eyes*: diameter  $3\frac{1}{2}$  in the length of the head, 1 diameter from the end of the snout, and  $1\frac{1}{4}$  apart. Interorbital space nearly flat, snout obtuse; upper jaw the longer; mouth wide, the extent of its cleft not being quite equal to half the width of its gape. The posterior extremity of the maxilla does not reach to beneath the front edge of the eye. Lips thin, with a deciduous horny covering, lost in the single example from Gwadur, but present in both of those from Trál. No tubercle at symphysis. *Barbels*: a single, short, maxillary pair. *Teeth* rather compressed, flattened at their extremities, 5, 3, 2 | 2, 3, 5. Pseudobranchiæ well developed. *Fins*: dorsal commences midway between the end of the snout and the base of the caudal fin; its last undivided ray is osseous, rather weak, but strongly serrated; its anterior rays are as high as the base of the fin is long: pectoral as long as the head, excluding the snout; ventral inserted beneath the middle of the dorsal fin; anal commences midway between the bases of the ventral and caudal fins, the latter forked. *Scales* in regular rows; four rows between the ventral fin and the lateral line. *Lateral line* goes almost direct to the centre of the base of the caudal fin. *Colours*: silvery, darkest along the back; fins grey, the edges being stained rather darker.

*Habitat*. River near Gwadur, from which it was procured by Colonel Miles. The example is 4 inches long; two, also from Trál, sent by Dr. Duke, the longer  $4\frac{1}{2}$  inches. It agrees with Valenciennes' short description of *Chondrostoma aculeatum*, which was obtained from Persia.

## SCAPHIODON MICROPTHALMUS, n. sp.

B. iii. D. 13 ( $\frac{3}{10}$ ). P. 17. V. 9. A. 2 | 8. C. 19. L. 1. 39. L. tr. 6 | 5.

Length of head  $5\frac{1}{2}$  to  $5\frac{1}{4}$ , of caudal fin  $5\frac{1}{4}$ , height of body  $4\frac{1}{2}$  in the total length. *Eyes* small, diameter  $5\frac{1}{2}$  in the length of the head, 2 diameters from the end of the snout, and  $2\frac{1}{4}$  apart. Interorbital space slightly convex. The greatest width of the head equals its length excluding the snout. Mouth somewhat overhung by the snout; upper jaw rather overlapping the lower. Mouth wide; lips with a horny covering; the posterior extremity of the maxilla does not extend quite so far as to below the anterior edge of the orbit. Preorbital wider than the rest of the suborbital ring of bones. Nostrils close together, patent, and nearer to the eye than to the end of the snout. *Barbels*: a short maxillary pair two thirds as long as the eye. Pseudobranchiæ present. *Teeth*: pharyngeal, plough-shaped, 5, 3, 2 | 2, 3, 5. *Fins*: the dorsal commences nearly midway between the end of the snout and the base of the caudal fin, its last divided ray weak and

articulated; the height of its anterior rays equals the length of the base of the fin; its last ray divided to its base. Pectoral inserted below the middle of the height of the body, it is nearly as long as the head. Ventral short, its length equalling that of the post-orbital length of the head; it is inserted beneath the first divided dorsal ray. Anal commences very slightly nearer the base of the caudal fin than the insertion of the ventral; it is rather more than twice as high as it is wide at its base. Caudal forked, lower lobe the longer. *Scales*: the two rows just above the lateral line are rather enlarged; four rows between the lateral line and insertion of the ventral fin. *Lateral line* slightly concave, passing to the centre of the base of the caudal fin. *Colours*: silvery, lightest along the lower two thirds of the body; "when fresh, they had brilliant scarlet spots on their bodies and below their gills" (*Duke*). Fins grey, darkest externally, and with a light outer edge.

*Habitat*. Quetta: two examples captured Oct. 18, 1877, one 6, the other  $6\frac{1}{2}$  inches in length.

The extensive genus *Barbus*, of which at least seventy species, besides many varieties, have been recorded from India, Ceylon, and Burma, does not appear to be largely represented in Afghanistan.

#### BARBUS TOR, Ham. Buch.

Dr. Duke's collection\* contains one specimen of the true Mahseer,  $9\frac{1}{2}$  inches in length. It is of the variety in which the central lobes to the upper and lower lips are not well developed. I found this species likewise pretty abundant on the Sind side of the Beluchistan range of hills. Griffith alludes to having taken the Mahasir, and also a *Barbus* closely allied to it, from Gurmah, where there exists a branch stream falling into that of the Bolan Pass. In the Bolan rivers he observed them (*B. tor*) in abundance, but not attaining any size, the largest weighing perhaps 3 lb.

#### BARBUS MILESI.

B. iii. D. 13 ( $\frac{3}{10}$ ). P. 13. V. 8. A. 2 | 7. C. 19. L. 1. 39. L. tr.  $6\frac{1}{2}$  |  $7\frac{1}{2}$ .

Length of head  $4\frac{1}{2}$ , of caudal fin  $5\frac{1}{2}$ , height of body  $4\frac{1}{2}$  in the total length. *Eyes*: diameter  $4\frac{1}{2}$  in the length of the head,  $1\frac{1}{2}$  diameter from the end of the snout, and also  $1\frac{1}{2}$  apart. Snout somewhat compressed and pointed; mouth anterior, upper jaw slightly overlapping the lower. Lips thick, but no continuous fold behind the symphysis of the lower jaw; no lobes to the lips; the posterior extremity of the maxilla reaches to beneath the front edge of the orbit. The greatest width of the head equals two thirds of its length. *Barbels*: a thin maxillary pair about a half as long as the orbit. *Teeth* pharyngeal, 4, 3, 2 | 2, 3, 4, rather crooked and pointed at their outer extremity. *Gill-rakers* short and widely separated. Pseudobranchiæ present. *Fins*: the dorsal commences rather nearer the base of the caudal than to the end of the snout; its last undivided ray is osseous, strong, serrated, and as long as the postorbital portion of the head;

the height of the anterior rays are equal to the length of the base of the fin. Pectoral as long as the head, excluding the snout; its rays very stiff. Ventral inserted beneath the first divided dorsal rays; it is rather longer than the pectoral, but does not reach the base of the anal. The anal commences slightly nearer to the ventral than to the caudal fin; if laid flat, it reaches the latter. Caudal forked, lower lobe the longer. *Scales*:  $5\frac{1}{2}$  rows between the lateral line and the base of the ventral fin. *Lateral line* at first slightly concave, then continued just to the centre of the base of the caudal. *Colours*: steel-blue superiorly, becoming light on its sides and beneath; body covered with very fine black specks. Fins dusky, darkest externally.

*Habitat*. Dr. Duke sent two examples,  $4\frac{1}{4}$  and  $5\frac{1}{4}$  inches respectively in length, taken in April 1877 from a spring at Trál.

*Variety*. Col. Miles sent me three examples, the largest being  $5\frac{3}{4}$  inches in length. They were taken from the river near Gwadur. They differ from Dr. Duke's specimens in that there are more scales between the lateral line and the base of the dorsal fin; but on very carefully comparing the specimens, it seems as if many of the scales were subdivided into two, causing this variation; its pectoral rays are not so stiff; and the eye is a little smaller.

#### BARBUS TERIO, Ham. Buch.

The examples of this fish sent by Dr. Duke differ from the typical form in that the last undivided dorsal ray is weak and partially articulated.

#### NEMACHEILUS — ?

Dr. Duke has sent several young examples of a species of this genus; but they are too small and in too bad a state of preservation to render it safe to describe them, though they appear to me to be of a species not as yet described, so far as I am aware. It is probably identical with the form obtained by Griffith from the same locality. It is banded with transverse bars of yellow rather wider than the ground-colour, these bars taking on a somewhat angular form near the tail. Col. Miles sent me several small ones of the same species from the river near Gwadur.

In the winter of 1871 I was engaged in investigating the fisheries of Sind; and from Larkhana I turned off to Ghaibi Dehra, and then into the Beluchistan hills for the purpose of examining what species exist in the streams. The first river reached was that at Sita, in the vicinity of which place it disappears into the ground; while, a few miles further on, its origin is as sudden as its disappearance. At this latter locality it is quite hot as it emerges from the earth, while evidences of volcanic action are to be seen all around. In this stream, which is largely impregnated with salt, I obtained the following—*Labeo caeruleus*, Day, *L. diplostomus*, Heckel, *L. dyocheilus*, McClelland, *Scaphiodon watsoni*, Day, *Cirrhhina lutia*, Ham. Buch., *Botia geto*, Ham. Buch. These fishes are all forms common in India,

except *Labeo caeruleus*, which has not been obtained elsewhere. *Scaphiodon watsoni* may perhaps be found somewhere along these hills; anyhow it has been taken in the Salt range of the Punjab. Having passed the night under a rock in the vicinity of the origin of this river, we continued our ascent the next morning until we attained to about 3500 feet above the level of the sea; here another river, the Nuzarani-ni, was arrived at, of which the appearance was as sudden as that of the Sita stream, while its waters were quite as saline. At its origin I obtained *Scaphiodon watsoni*, Day, and *S. irregularis*, Day, a form which I did not obtain elsewhere, but which I now find extends along these hills towards Quetta. This being the highest point of the hills, or Durra ahlu, we stayed there the night, and descended next day along the course of the river, which soon became enlarged and then disappeared into the ground. I took *Mastacembelus armatus*, Lacép., *Labeo dyocheilus*, M'Clelland, *L. sindensis*, Day, *Cirrhitina latia*, Ham. Buch., *Barbus tor*, Ham. Buch., *Chela bacaila*, Ham. Buch., and *Wallago attu*, Bloch. The fishes, obtained from the lower portion of the river, were altogether forms restricted to Sind and India; while it seems to me probable that the *Opsarius* referred to by M'Clelland as having been obtained by Griffith in the river in the Bolan Pass was a *Chela*, as this genus is included among his *Opsarii*; it was probably *Chela bacaila*, which I found in this Nuzarani-ni river, or else *Barilius vagra*, Ham. Buch., which I took in the Garj and Nulli-ni streams.

The next river I came to after leaving Ghul Mohammad was the Garj, reached in a ten-miles journey. Here it emerges from the hills, and is of considerable size. I obtained here *Labeo diplostomus*, Heckel, *L. dyocheilus*, M'Clelland, *Cirrhitina reba*, Ham. Buch., *C. mrigala*, Ham. Buch., *C. latia*, Ham. Buch., *Barbus tor*, Ham. Buch., *Chela bacaila*, Ham. Buch., *Nemacheilus botia*, Ham. Buch., and a small *Amblyceps*.

The last hill-river examined was the Nulli-ni, which ceases in the early months of the year about three miles from Kota Meer Mohammad. Although rising in the hills, it has more water than some of the rivers that come from a greater distance. Its bed is full of weeds, so that to use a net is very difficult. In some few pools a few fine Mahaseers (*Barbus tor*) were observed. The fish obtained were *Mastacembelus armatus*, Lacép., *Ambassis nama*, Ham. Buch., *Ophiocephalus striatus*, Bloch, *O. aurantiacus*, Ham. Buch., *Haplocheilus panchax*, Ham. Buch., *Labeo rohita*, Ham. Buch., *L. calbasu*, H. B., *L. diplostomus*, Heckel, *Cirrhitina reba*, H. B., *Barbus sarana*, H. B., *B. tor*, H. B., *B. ticto*, H. B., *Barilius vagra*, H. B., *Danio devario*, H. B., *Chela bacaila*, H. B.

If the foregoing fishes are tabulated, excluding the rare local forms, the following results are arrived at:—*Ambassis nama*, *Ophiocephalus striatus* and *O. aurantiacus*, *Haplocheilus panchax*, *Labeo rohita* and *L. calbasu*, *Cirrhitina reba* and *C. mrigala*, *Barbus sarana* and *B. ticto*, *Barilius vagra*, *Danio devario*, *Chela bacaila*, *Nemacheilus botia*, and *Wallago attu* are all fishes of the plains of India which have extended a longer or shorter distance up the hill-streams, but are un-

doubtedly Indian forms. *Labeo diplostomus* and *L. dyocheilus*, *Cirrhitina latia*, *Barbus tor*, and *Botia geto* are fishes with a widely extended range, found on many of the Indian hills, while some extend far into the plains; while two at least, *Barbus tor* and *Cirrhitina latia*, are evidently extensively spread in Beluchistan and Afghanistan. Perhaps among the fishes which I obtained on the Sind side of these hills, *Scaphiodon* leads us most naturally from the Persian to the Indian fauna. *S. irregularis* seems to be a common form near Quetta; but I have only obtained it in Sind from the highest point of one of the mountain-streams; whereas *S. watsoni*, which seems to commence on the summit of these hills, passes down into the waters of the plains, and is found even in the salt-range of the Punjab.

The fishes in the collections adverted to as obtained from the high lands of the Beluchistan range of hills furnish us with a single instance of an Acanthopterygian from the Bolan Pass, a locality which perhaps we may well object to as not being at a high elevation. This fish is the *Mastacembelus armatus*, which I likewise obtained from one of the rivers descending from this range to Sind. But this fish may have passed up from the Sind side, being found throughout the Indian region both on the plains and even on the hills, while it extends to China. This genus has likewise been recorded from Syria and also from West Africa.

Among the Siluroids Griffith records *Silurus kuggur* from the Bolan; the Kuggur in Sind is the *Rita buchanani*, a fish one would hardly expect to find in this locality; still it exists in the Cabul river at Peshawur and all down the Indus. Another fish, a *Macrones*, is likewise termed *kuggur* in some localities; and several species are spread through Sind, one of which may be the form referred to; it would seem, however, to be a straggler from the Indian region. *Callichrous pabda* was obtained in the hills by Dr. Duke; it is remarkable that this form has also been taken at as great a height as Darjeeling in the Himalayas; while it is also found along the deltas of the Ganges, Indus, and Brahmaputra. It may perhaps be considered a vagrant form and a straggler from the Indian region, when, finding some warm valley, it remains there and propagates its kind.

The Cyprinidæ form the bulk of the collections; and we may observe the following fishes present on the high lands of Kelat and Quetta:—*Cirrhitina latia*, also found near Gwadur, and observed generally through India except south of the Kistna and on the Malabar coast; *Scaphiodon irregularis*, which, passing along these hills, extends to their Sind aspect; *S. aculeata* not only at Quetta, but also at Gwadur; *S. microphthalmus*, Quetta; *Barbus tor*, largely distributed in the Indian region; *B. milesi*, both from those hills and Gwadur; *B. terio*, another widely spread Indian form.

It is evident, if we may judge from the foregoing facts, that the fish-fauna of this range of hills differs essentially from what obtains along the summit of the Himalayas; for the Schizothoracinae, so very typical of what exists there, are entirely absent from the Beluchistan range.

The characteristic genus of the Beluchistan fish-fauna would seem to be *Scaphiodon* or *Barbus*; but, if I may judge from the number of examples sent of each, the former is the most common. The genus *Barbus* is found generally distributed throughout Europe, Asia, and Africa; consequently the existence of some forms in Beluchistan was to be anticipated; but out of the three obtained, two seem to be common to India. *Scaphiodon* extends from the rivers of Syria and Western Asia, along Beluchistan, to the summit of the range of hills; then passing over into Sind, one form is found to be present even in the Salt range of the Punjab. Then we find they are absent until we reach the Western Ghauts, where they are present as far south as the Neilgherry hills and rivers along their bases. This genus is entirely absent from the Himalayas and the plains of India. The fishes of the fresh waters of the Meckran coast appear to be similar to those of the higher regions of Kelat and Quetta, and would seem to be distinct from those of the deltas of the Helmund and the Cabul river. What exists along the Sulimans is as yet an unsolved problem.

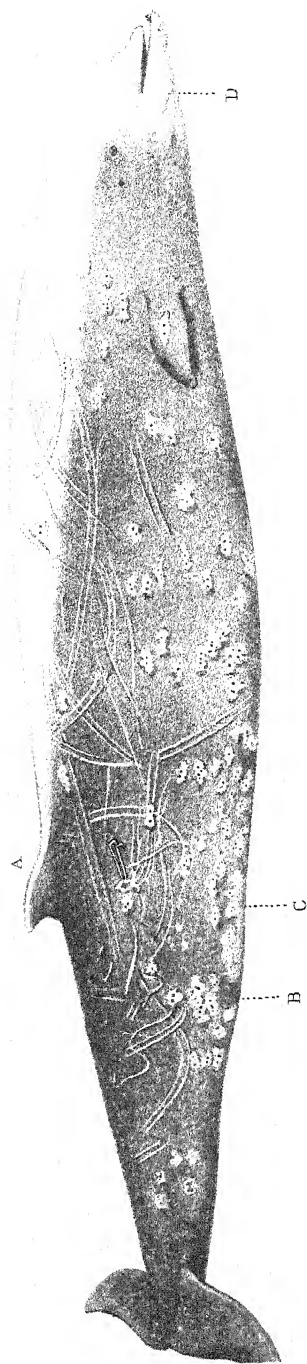
2. On *Ziphius novæ-zealandiæ*. By Prof. JULIUS VON HAAST, Ph.D., F.R.S., C.M.Z.S., Director of the Canterbury Museum, Christchurch, New Zealand.

[Received February 18, 1880.]

(Plate XXIII.)

In the 'Proceedings' of this Society for 1876, p. 466, I gave a description of the skeleton of this interesting southern Ziphioid Whale. I there gave, on the authority of the late Mr. F. Fuller, Taxidermist of the Canterbury Museum (who went to secure the skeleton of that specimen, stranded in Lyttelton Harbour), some details about the characteristic form and colour of the skin of the animal in question. When my informant arrived where the fishermen were at work, he found that the blubber had nearly all been taken off; so that he could only partially obtain the required measurements. From the observations I am about to offer to the Society, on two more specimens stranded since then on our sea-beach, it will be seen that some of the statements were far from being correct; in fact, the animal was so much cut about that its lower part was taken for the upper, and *vice versa*; and consequently no dorsal fin could be found where it was looked for.

The first of the specimens now under review was stranded on Sunday, November 17, 1878, near New Brighton. There were numerous visitors at the time, who observed another whale (according to other lookers-on two whales) in the offing, by which the animal was driven into the surf, where soon it became helpless. Gradually it was drifted upon the low sandy beach, where it died only after a long struggle.



Head and eye

TSCossins del. J. Smith lith.

ZIPHIUS NOVÆ-ZEALANDIÆ.





Having received prompt information, I arrived early next morning on the scene, and found the animal quite intact; so that I was able not only to take the necessary measurements, but also to have a careful sketch prepared (Plate XXIII.). This, as the sequel will show, is of importance, in offering us some curious information as to the habits of this species of Ziphoids.

*Colour.* Head, neck, and anterior portion of the back, as far as the dorsal fin, white; the rest of the body black, a white narrow line running along the edge of the dorsal fin, which is otherwise black. The line of division between the two colours is everywhere well marked except upon the cheeks, where blackish blotches advance some distance towards the nose. The form of the animal is rather slender for its length, its height at the occiput being only 2 feet 3 inches, and about 9 feet from the tip of the lower jaw 3 feet 3 inches, after which it tapers gradually to the tail. The animal proved to be a young female.

The two teeth at the termination of the lower jaw stood half an inch above the gums, having a diameter of one inch where they rose above the latter. They are conical, and have a sharp apex, and are not covered anywhere with enamel, not even on the tip. The dentine shows a number of horizontal lines one above the other, running round the tooth. They are therefore quite different from the teeth of the two specimens described in vol. ix. of the Transactions of the New-Zealand Institute, which were found to be covered with a rough cement. They are also different from those of another specimen, of which I shall give some details further on.

A single fold begins below the throat, 1 foot 1 inch from the tip of the lower jaw. After rising rapidly for 4 inches, it continues for 7 inches more at a smaller angle, ceasing where the black colour of the throat begins; this fold is separated into two portions by a ridge of the breadth of half an inch below the centre of the throat. Lips flesh-coloured; roof of mouth slaty black; no signs of teeth along the jaws; there is, however, a hardened ridge along each side of the palate. The extremity of the lower jaw projects about 2 inches beyond the upper. The head rises steeply above the upper lip to the forehead. The blowhole is situated on the vertex of the head, just above the eye. Both the form and the size of the dorsal fin, and of the tail-lobes, show that this species must be a remarkably swift swimmer.

<i>Measurements.</i>		ft.	in.
Total length . . . . .		19	6
Greatest circumference . . . . .		9	9
From point of lower jaw to the beginning of the pectoral fin . . . . .		4	9
From fork of tail to termination of falcate dorsal fin . . . .		6	5
Length of the opening of the mouth . . . . .		1	3
From point of lower jaw to eye . . . . .		2	6
From point of lower jaw to beginning of fold below throat . .		1	1
Diameter of blowhole, concave towards head . . . . .			6

*Measurements (continued).*

	ft.	in.
From fork of tail to vent .....	5	4
From fork of tail to pudendum .....	6	6
Breadth of caudal fin .....	6	1
Base of dorsal fin .....	1	1
Height of dorsal fin .....		8
Breadth of pectoral fin .....		7
Length of pectoral fin .....	2	6
Eye, horizontal diameter .....		1½
Eye, vertical diameter .....		1

Before giving a description of the external appearance of the specimen under review, I wish to allude to another female, 21 feet 6 inches long, of the same species, stranded on May 15, 1879, on the sea-beach near Kaiapoi, and of which the skeleton was also secured. This was doubtless a full-grown, aged animal, the terminal epiphyses being so well ankylosed to the body of the vertebræ that even the line of junction could be scarcely distinguished, while in the New-Brighton specimen these disks were still unankylosed and detached themselves readily during maceration.

In form of the body and coloration this animal resembled in every respect the New-Brighton specimen.

However, the two teeth existing at the tip of the lower jaw could not be felt when passing the fingers over the gums, and were only disclosed when making incisions. The teeth are the smallest of all those known to me, being 1·98 and 2 inches long, and only ·46 of an inch broad. The left tooth weighs 66, and the right 62 grains. The flattened root is square, and somewhat constricted a quarter of an inch above the base, after which the tooth expands, being broadest about the middle. It then contracts rapidly, running out to a sharp point. There is thus confirmatory evidence that the teeth with age are absorbed and disappear gradually below the gums, although it is possible that even below the gums they may still be of some use to the animal. It is a peculiar character of the small teeth of the Kaiapoi specimen that they should be so very thin and terminate in a sharp point, and that the latter should be covered with real enamel, different from any observed upon the dentine in any other teeth of the same species.

Returning to the first-mentioned specimen from the New-Brighton beach, and of which the annexed sketch (Plate XXIII.) gives a faithful representation, it must strike us with astonishment to see the skin of this animal (a female) so fearfully lacerated. The late taxidermist of the Museum, when giving me some notes of the external appearance of what remained of the specimen stranded in Lyttelton Harbour in July 1872, informed me that the upper portion was marked by numerous oval spots, two to three inches across, like the skin of the Leopard; this, as I have observed already, was the lower portion. Moreover he thought that the animal must have had fearful struggles amongst the rocks, the skin appearing torn in all directions. These peculiar oval spots were visible at the first glance on the skin of the

New-Brighton specimen; but on examining them more closely, it at once became clear that they were not natural, but were the scars of injuries the animal had received during lifetime at various periods. At the same time the animal was also covered with a number of seamed scars running in all directions, of which the form and regularity proved also that they could not have been caused by the animal being thrown amongst the rocks, but must have been inflicted by some other animal. Examining the oval spots, I found that although they varied from a length of 2 inches to that of 3 inches, and from a breadth of 1 inch to that of 2 inches, they had invariably the same character, viz. that of an oval scar of a dirty whitish colour, both in the white and the black coloration of the skin, with two well-marked points in the centre, always about one and a quarter to one and a half inch apart. These two dots had evidently been the wounds inflicted, round which the scar had been formed. In some instances these points were quite healed over, so as to show that the injury had been done long ago; in others there were two fresh sores, as if the animal had been struck only a few hours before its death.

Although occurring all over the body, with the exception of the back, these oval scars were most frequent below the belly, and principally round the pudendum, where they were often so close together that the scars not only ran into each other, but evidently covered each other, so as to show that the same spot had been struck repeatedly. The seamed scars, on the other hand, occurred more numerous on both sides of the animal; only a few crossed the back or reached to the belly. With a few exceptions these seamed scars were always in pairs  $1\frac{1}{4}$  to  $1\frac{1}{2}$  inch apart, and each about  $\frac{1}{4}$  inch broad. Some of them ran for a considerable distance, seven to eight feet, others only for the space of a few inches. That there had been a considerable struggle became evident from the direction these seamed scars had taken, some forming regular hooks; some of these wounds were evidently of long standing, being well healed; others had been inflicted a very short time before the stranding of the animal, as they were quite fresh and deep, and sometimes had a breadth of  $\frac{2}{3}$  of an inch. From the character of these wounds, it appears certain that they could have only been made by an animal or animals of the same species with the two teeth of the lower jaw, the distance of their apices being one and a quarter to one and a half inch from each other, and thus corresponding with both the oval and seamed scars. The aged female from the Kaiapoi beach, of which I gave some particulars on the preceding pages, was scarred and seamed in exactly the same manner.

It is thus evident that the females are subject to attacks either from the males during rutting-time, or that they fight amongst themselves. In the latter case (which, however, appears to me to be rather improbable) the teeth of the specimen figured must have been of considerable use to the animal; and it is then difficult to understand how the full-grown or aged animals, when their teeth disappear below the gums, can successfully resist the attacks of the younger members

of the same species, unless their greater bulk, or probably greater speed, make up for this disadvantage. Of the males of *Ziphius novæ-zealandiæ* we know nothing at present; but there is no doubt in my mind that with them the teeth in front of the lower jaw are both permanent and of larger size than those of the females, just in the same manner as in other Ziphioid genera. Fortunately, however, there is some evidence at hand, strengthening such a hypothesis. Dr. Hector, in his account in the Transactions of the New-Zealand Institute (on p. 164, vol. v.) of the skull of *Epiodon chathamensis*, obtained in the Chatham Islands, describes the teeth of this species as follows:—"The lower jaw . . . terminates in two short, stout, slightly compressed teeth, 2 inches long and 4 in circumference, implanted in shallow sockets. The teeth have slight irregular striae, and are worn down into two lateral facets divided by an acute ridge. The position of the teeth when the jaws are closed is two inches beyond the upper mandible; and, unless they are applied against callosities on the upper lip, it is difficult to conceive how they are worn down to this acute form. Weight of teeth 817 and 836 grains." "Two teeth of similar form, taken from the jaw of a whale cast up on the Manawatu beach, have their facets forming an obtuse pyramidal tip." Of this last pair of teeth no weight is given; but it is evident from the drawing that they must be as heavy as the former. The teeth of the females examined by me range from 62 to 200 grains. There is no doubt that the form and chief characteristic features of the skull from the Chatham Islands described as *Epiodon chathamensis* and those of the two female whales secured by me are almost identical, if we except the teeth, which in the former are at least four times as heavy as in the latter. In my paper published in the 'Proceedings' of this Society for 1876, p. 468, I pointed out already that the skull of this Chatham-Island whale might have belonged to the male of *Epiodon novæ-zealandiæ*, thus accounting for the difference.

After having seen the two female animals stranded on our beach scarred in such a remarkable manner, I am more than ever inclined to this opinion. If the three specimens alluded to had been males, it would be easy enough to understand that the wounds had been inflicted during their fights in rutting-time, or for supremacy, as this is the case with most terrestrial animals. However, the fact that the wounds by which the oval scars were produced are mostly in close proximity to the pudendum, suggest forcibly that they have been inflicted by male animals.

With respect to the external appearance of the different species of other Ziphioid genera, such as *Mesoplodon*, *Berardius*, and *Oulodon*, of which several specimens, both male and female, have been examined by me, I may state that none of them had the least scar or wound upon them. Of course this may be accounted for by the fact that the teeth of most of these genera are situated so far backwards that they could scarcely be used for the same mode of attack. Dr. Hector, in the 'Transactions of the New-Zealand Institute' (p. 338, vol. x.), gives an account of the capture of an adult male of *Berar-*

*dius arnouxii* at the entrance of Wellington Harbour on January 12, 1877, from which it appears that "the teeth did not penetrate the gums, nor could their position be discovered till deep incisions were made." This leads me to conclude that the male of this species cannot use the teeth in the same manner as *Ziphius novæ-zealandiæ* does. Thus this species of Ziphiod Whale, as far as our observations in New Zealand go, stands apart in this strange habit of life, by which, so far as we know at present, both young and aged females are made sufferers, the form and peculiar position of the teeth in front of the protruding lower jaw making these savage attacks possible. It will be of some interest to obtain a male of the same species, in order to ascertain if it is also covered with similar scars.

The outlines of the right side of the animal were drawn from careful measurements, and the oval and seamed scars conscientiously copied from nature by Mr. T. S. Cousins.

Finally, I should like to make a few observations on the nomenclature and the changes proposed. There is no doubt that the generic name *Epiodon* must give way to *Ziphius*; but I think it rather premature to follow Dr. Hector's example and to merge our New-Zealand species in the European *Ziphius cavirostris* of Cuvier, till we possess some more detailed accounts of the form, colour, and anatomical structure of the different species of *Ziphius* described under various names from other countries.

For instance, we know already that the *Epiodon australis* of Burmeister had a light ash-colour ("ceniza clara"), that it was darker on the back, lighter on the belly, and, moreover, that its forehead was not swollen. *Epiodon desmarestii*, according to Risso, is steel-grey, with numerous irregular white streaks, beneath white, head not swollen, ending in a long nose. Consequently there is considerable difference in the appearance of both these well-described species when compared with the New-Zealand *Ziphius*—a difference which certainly is of some specific value, and ought not to be set aside without good cause being shown to the contrary.

#### EXPLANATION OF PLATE XXIII.

Sketch of female *Ziphius novæ-zealandiæ*, from the specimen stranded at New Brighton, New Zealand, November 17, 1878; reduced.

A. Dorsal fin. B. Vent. C. Pudendum. D. Gular fold.

## 3. On the Cranial and Dental Characters of the Canidæ.

By T. H. HUXLEY, F.R.S.

[Received March 17, 1880.]

	Page
1. Introductory .....	238
2. The method of estimating cranial and dental differences .....	239
3. Comparison of <i>C. vulpes</i> and <i>C. azara</i> . Alopecoid and Thoooid series ..	240
4. Macrodon and microdon forms in each series .....	248
5. Small and large sagittal areas in each series .....	250
6. Nonlobate and lobate mandibles in each series .....	251
7. Forms transitional between those with lobate and those with nonlobate mandibles .....	253
8. The range of modification in the Thoooid and in the Alopecoid series...	255
9. The genus <i>Otocyon</i> .....	256
10. The arrangement of the Canidæ .....	261
11. The affinities of <i>Otocyon</i> .....	262
12. The geographical distribution of the Canidæ .....	264
13. The phylogeny of the Canidæ .....	278
14. Conclusion .....	284
List of Woodcuts .....	288

1. The unsatisfactory character of the attempts which have hitherto been made to determine the natural affinities of the numerous members of the group of Canine Carnivores must have impressed itself upon the mind of every one who has paid close attention to these animals. But I do not think that the discussion of the merits and demerits of the various systems of classification of the Canidæ which have been proposed would serve any useful purpose; and it is the less incumbent upon me to undertake the task at present, as I propose to deal with the question in a manner somewhat different, so far as I know, from any which has yet been pursued.

The general uniformity of the structure of the Canidæ is well known. There is a remarkable constancy in the characters of all the organs, down even to the minuter details of the patterns of the crowns of the teeth, accompanied by variations, within comparatively narrow limits, in the form and proportion of the parts. The number of the præsaclral and sacral vertebræ always remains the same, and that of the caudal vertebræ varies only within narrow limits. In the skull, there is a considerable range in the proportions of the jaws to the brain-case, and in the extent to which the temporal ridges, always widely separate in young animals, approach and coalesce into a sagittal crest in the adult. The greater or less backward extension of the nasal bones, the union or separation of the nasal processes of the frontal bones with the ascending processes of the præmaxillaries, and the variations in the form of the supra-orbital processes have been noted. The straightness or angulation of the line of the molar and præmolar teeth, and the proportions of the sectorial teeth to those which follow them, have been taken into account, as well as minor characters of the teeth themselves. Attention has been directed to the excess of teeth above the normal

number in *Otocyon*, and to the diminution of the number in *Cyon* and *Iticyon*. The variation in size of the pollex and its disappearance in *Lycaon* are well known. The differences in the form of the pupil have been noted; and, of late, particular notice has been taken of the extensive modifications in the form of the cæcum. Weight has been attached to the presence or absence of a caudal gland.

The taxonomic value of these variations, however, has remained doubtful. That of the proportional lengths of the nasal bones, for example, is justly disputed by Wagner<sup>1</sup>. Satisfactory evidence of the form of the pupil is hard to obtain, and does not appear to have any definite correlation with diurnal or nocturnal habits. The presence or absence of a caudal gland has been investigated in only a few species; and as it occurs in Wolves, Dogs, Jackals<sup>2</sup>, and Foxes, it is not likely to be of much importance. The proportions of the sectorial to the following teeth may be similar in Canidæ which are certainly not closely allied, and different in those which are. And the system of measurement hitherto usually adopted gives the absolute sizes of the teeth and their dimensions relatively to one another, but affords no clue to their proportions in relation to the size of the skull, or to the increase or diminution of individual teeth. The increase of the number of the teeth of *Otocyon* appears generally to be regarded merely as an anomaly.

There can be no doubt that the skulls and the teeth of the Canidæ vary from species to species more than any other part of their organization. One has only to put side by side with one another the skeleton of an *Otocyon* and that of a Wolf or that of a Fox, to see that the cranial and dental differences are very much greater than any which are observable elsewhere; and a glance at the skull and teeth of any other canine animal is sufficient to show that its characters give it a place somewhere between the former and the two latter. The problem therefore is how to give definite expression to the differences between *Otocyon*, Fox, and Wolf, and to determine by something better than vague eye-judgments the relation of the other forms to these.

2. When occupied with anthropological questions, a good many years ago<sup>3</sup>, I was confronted by the same kind of difficulty in endeavouring to arrive at an exact conception of the morphological relations of the skulls of the different races of mankind; and I was led to adopt a method of estimating cranial characters which still commends itself to me as that which is best calculated to meet the end in view.

Every constituent of the skull, like all other parts of the body, varies from individual to individual, and from youth to age. But the central region of the base of the skull, formed by the basis-occipital, basisphenoid, and præspenoid bones, represents the foun-

<sup>1</sup> Schreber's Säugethiere, Suppl. Bd. ii. pp. 365, 384, notes.

<sup>2</sup> I have found a small caudal gland in a female *C. mesomelas*, which recently died in the Gardens.

<sup>3</sup> "On two widely contrasted Forms of the Human Cranium," Journal of Anatomy, 1867.



dation around and upon which the other parts are built, and reaches its adult condition early. Moreover it answers to one of the most important parts of the central nervous system, the base of the brain. It is therefore eminently fitted to furnish a relatively fixed unit of measurement and standard of position, to which the dimensions and the position of the other parts of the head and face, with the teeth, can be referred.

In order to obtain such a standard, a median line is drawn in the bisected skull, from the hinder edge of the basioccipital bone to the junction between the præsphænid and the ethmoid in the base of the skull. I call this line the *basicranial axis*; and its value is taken as 100. The measurements of the other parts of the skull can then be expressed in terms of 100, and their development, irrespectively of the absolute size of the animal, becomes apparent. Sectional diagrams of different skulls, in which the basicranial axis has the same absolute length, show not only the different proportions of corresponding parts, but bring to light the relative depth, length, and inclination of the palate.

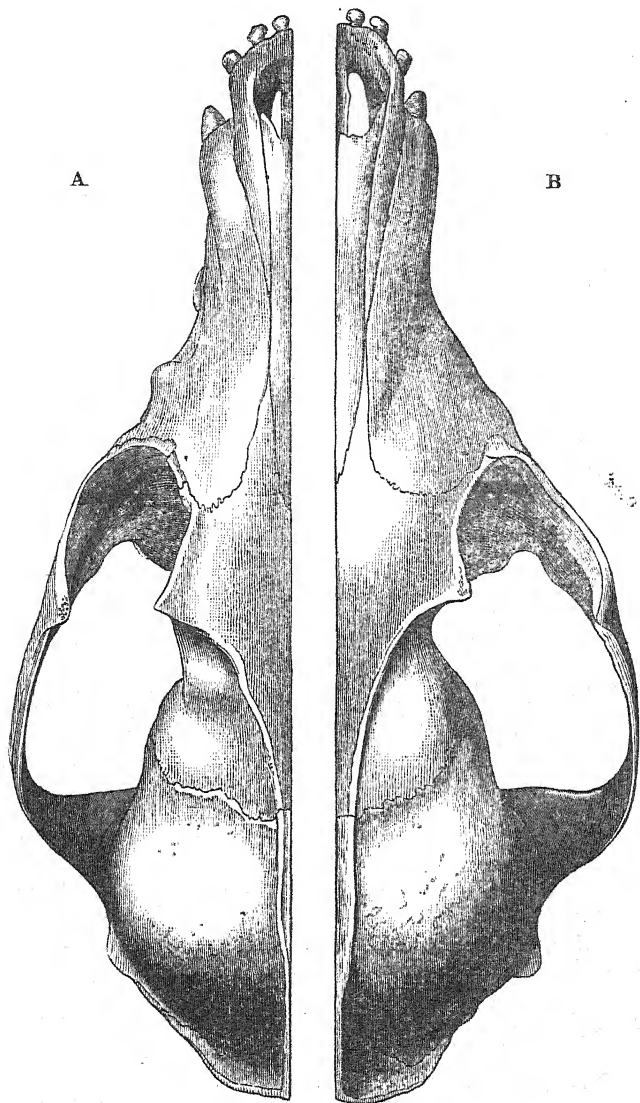
This method of procedure is a little troublesome at first; but practice makes it easy, and the results are very satisfactory.

When, as often happens, the skull under examination cannot be bisected, a sufficiently close approximation to the true length of the basicranial axis may be obtained by taking the distance along the median line of the base of the skull from the posterior edge of the basioccipital bone to a point opposite the middle of the distance between the optic and the ethmoidal foramina. This point always lies a little behind the posterior extremity of the vomer.

3. I will illustrate the method which I have described by comparing the skull of a common Fox with the skull of an animal which died in the Zoological Society's Gardens, and came to me labelled "*Canis azaræ*, South America." It corresponds very closely with the skulls also assigned to *Canis azaræ* by De Blainville ('Ostéographie,' *Canis*, pl. iv.) and by Burmeister ('Erläuterungen zur Fauna Brasiliens').

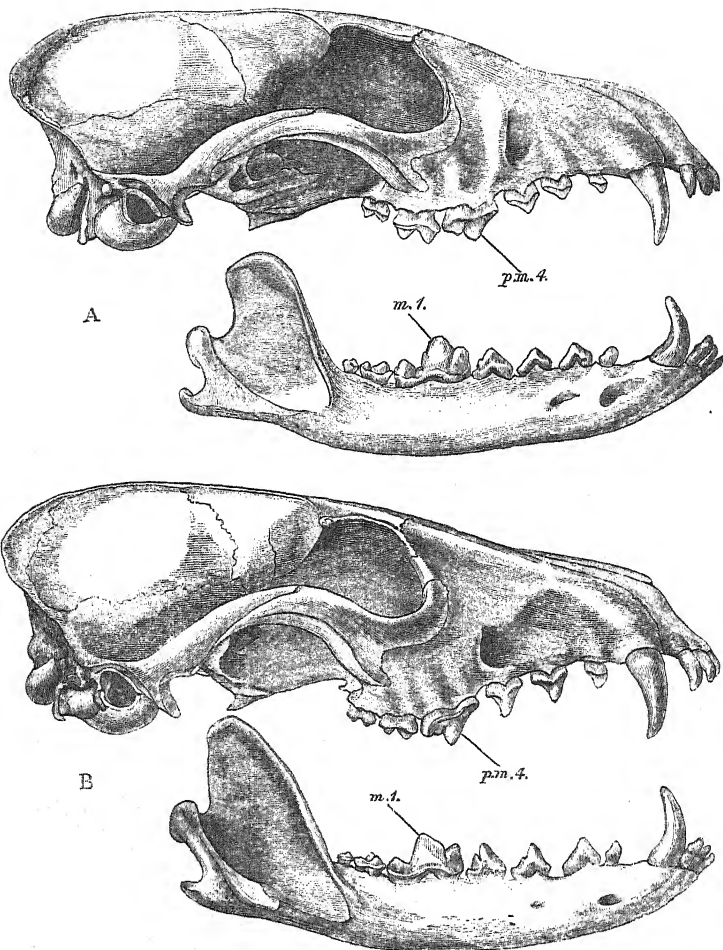
In their actual dimensions and in their general form these two skulls are very similar, except that the zygomatic arch of the European is stronger and more sharply arched than that of the South-American animal, and that the longitudinal contour of the face is straighter in the Fox, in consequence of a slight convexity of the interorbital and posterior nasal regions in *C. azaræ*. The ramus of the mandible of *C. azaræ* is somewhat deeper at the level of the last molar tooth, and its coronoid process is less high and less inclined backwards, while the ventral contour is more sinuous. Other minor differences will be obvious on comparison of the figures.

Fig. 1.



Dorsal view of the left half of the skull of *Canis azaræ* (A) and of the right half of the skull of *C. vulpes* (B), placed side by side. Natural size.

Fig. 2.



Lateral views of the skulls of *C. azaræ* (A) and *C. vulpes* (B).  
Reduced to two thirds of the natural size.

TABLE I.—Measurements of the Skulls of *C. vulpes* and *C. azaræ*.

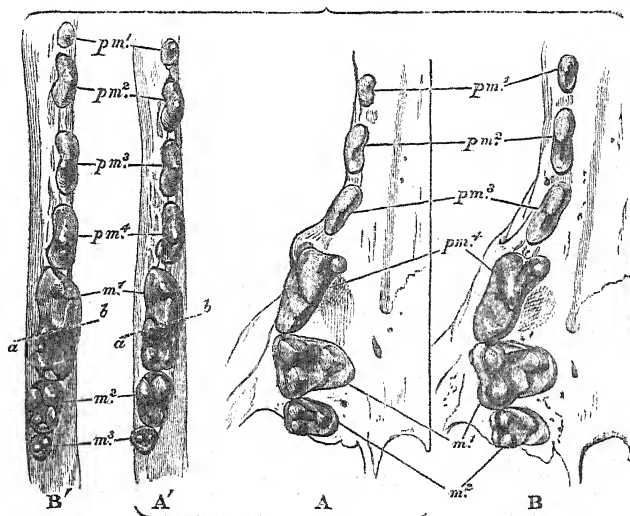
	<i>C. vulpes.</i>	<i>C. azaræ.</i>
Total length .....	143	142
Zygomatic width .....	74	72
Length of bony palate .....	73	72
Width " " .....	41	41
Length of basicranial axis .....	46	48

	<i>C. vulpes.</i>	<i>C. azaræ.</i>
Length of the ramus of the mandible in a straight line from symphysis to condyle .....	109	105

[In this and the following tables of measurements "total length" means the distance from the front edge of the præmaxillary bones to the extremity of the occipital spine. The "zygomatic width" is the greatest transverse distance between the outer faces of the zygomatic arches. The "length of the bony palate" is measured from the front edge of the symphysis of the præmaxillary bones to the hinder edge of the middle of the bony palate, not taking into account the inconstant median spine which is frequently developed. The "width of the bony palate" is the distance between the points at which the outer faces of  $\frac{pm.4}{m.1}$  and  $\frac{m.1}{m.2}$  meet. The "length of the basicranial axis" has already been defined. The measurements are given in millimetres.]

The differences in the dentition between *O. vulpes* and *C. azaræ* are very slight. In the upper jaw of the Fox the series of the

Fig. 3.



The crowns of the cheek teeth of *C. azaræ* (A) and *C. vulpes* (B). Natural size.

A, A', right upper and lower teeth of *C. azaræ*; B, B', the same of *C. vulpes*; a, b, "cusp-line" traversing the apices of the inner and outer anterior cusps of  $\frac{m.1}{m.2}$ .

molar teeth of opposite sides slightly incline towards the middle line behind, while in *C. azaræ* they are almost parallel. Hence the angulation of the line of the cheek-teeth between the last præmolar and the first molar (fig. 3, A, B) is rather more marked in *C. vulpes*.

The præmolar teeth are smaller in *C. azaræ*; but as they are more worn it is difficult to make an exact comparison. The upper sectorial is not quite so long as that of the Fox. The transverse diameter is the same in front, but is less behind, in *C. azaræ*; and its inner cusp is less forward in position and less prominent. The lower sectorial is narrower and the anterior internal cusp somewhat larger in *C. azaræ*. In both, a line drawn from the anterior-external to the anterior-internal cusp (*a b*, fig. 3, p. 243) makes an acute angle with a transverse line, on account of the not very backward position of the latter. In the Fox there is a very small secondary cusp between the inner anterior and the inner posterior cusps, which is absent in *C. azaræ*.

The second lower incisor lies completely behind the first in *C. azaræ*; but this is probably only an individual exaggeration of a tendency to the displacement of the second incisor backwards, which is often observable in the Canidæ.

TABLE II.—*Measurements of the Cheek-teeth of C. vulpes and C. azaræ.*

	<i>C. vulpes.</i>	<i>C. azaræ.</i>
Length of the whole upper præmolar and molar series . . . . .	54	50
Length of the whole lower præmolar and molar series . . . . .	60	57
Length of $\frac{pm. 4}{m. 1}$ . . . . .	13	12.5
„ $\frac{m. 1}{m. 1}$ . . . . .	9.3	9
Breadth of $\frac{m. 1}{m. 1}$ . . . . .	11	11
Length of $\frac{m. 2}{m. 2}$ . . . . .	5	5
Breadth of $\frac{m. 2}{m. 2}$ . . . . .	7.3	7
Length of $\frac{m. 1}{m. 1}$ . . . . .	15	14.3
„ $\frac{m. 2}{m. 2}$ . . . . .	7.3	7.5
„ $\frac{m. 3}{m. 3}$ . . . . .	3	3.5

In both *C. vulpes* and *C. azaræ* the hinder ends of the nasal bones just reach the level of the hindmost part of the fronto-maxillary suture. In the Fox the ascending processes of the præ-maxillary bones reach the anterior processes of the frontal bones, while in *C. azaræ* there is a wide interval between the two.

In both, the temporal ridges unite into a crest for a short distance behind; but for the rest of their extent they are separate, inclosing a very narrow *sagittal area* (fig. 1, p. 241). At the anterior extremity of this the ridges diverge and pass outwards to the angles of the supraorbital process; and it is at this point that the principal external difference between the two skulls becomes apparent.

In the Fox (fig. 1, B, p. 241), the well-defined ridge runs nearly parallel with its fellow for some distance in front of the coronal suture, and then sweeps outwards, in a sharp curve, to the recurved supraorbital process, behind which a deep constriction marks the boundary between

the interorbital and the temporal regions of the skull. In *Canis azaræ* the temporal ridge is not so well marked; and, beginning to diverge from its fellow a little in front of the coronal suture, it passes with a very slight curve to the angle of the supraorbital process, while the postorbital constriction is small (fig. 1, A). Moreover there is hardly any depression on the upper surface of the supraorbital process, the whole glabellar region being evenly arched from side to side. In the Fox, there is a well-marked depression on the outer part of the upper surface of the supraorbital process, and the glabella is flatter. These external differences answer to small but very definite distinctions which are seen in the longitudinal sections.

The superimposed sections of the two skulls correspond almost exactly.

In *C. vulpes*, as in all the Canidæ, the cribriform plate of the ethmoid bone is funnel-shaped, the concavity being turned towards the cranial cavity, while the convex surface looks outwards and upwards above, outwards and downwards below, into the nasal chamber. From its outer surface the delicate rolled laminæ of bone which answer to the superior and middle turbinals of human anatomy take their origin. The lower plates project backwards as far as the ethmo-præspenoidal suture; while the upper ones reach as far back as the junction of the ethmoid with the frontal bones, and are covered over by the orbital and nasal prolongations of those bones. In *C. vulpes*, however, there are no frontal sinuses; that is to say, behind the point of union with the ethmoid the median parts of the thin frontal bones are solid throughout. Moreover, if, as in man, we distinguish that part of the frontal bone which covers the anterior surface of the cerebral hemispheres, from that part which lies further back, as the forehead, then the forehead of the Fox is very short, while the vertical height of the ethmoid is proportionally great. In *Canis azaræ* there is a marked difference in all these respects (fig. 4, A, f, p. 246). A large frontal sinus is developed in each frontal bone, above and behind the fronto-ethmoidal suture. The forehead is much longer, while the height of the ethmoid is less.

In both skulls a well-defined ridge (fig. 4, a) answers to the supraorbital sulcus, and marks off the region occupied by the curved lateral gyri from that of the orbital and frontal gyri of the brain. But in the Fox this ridge (fig. 4, B, a) is directed upwards and forwards, and its dorsal end is separated by but a small distance from the dorsal margin of the cribriform plate of the ethmoid; while in *Canis azaræ* the dorsal half of the ridge (fig. 4, A, a) is inclined slightly backwards, and its end is far more remote from the edge of the cribriform plate. Moreover the inner wall of the skull is much more sharply bent inwards along the dorsal half of the orbito-frontal ridge than it is in the Fox.

These differences have their counterparts in the form of the brain, and become very manifest when casts of the interior of the skull are compared (fig. 5, p. 247). In the Fox the contour of the brain, viewed from above, is that of a pear with the narrow end forwards. Late-

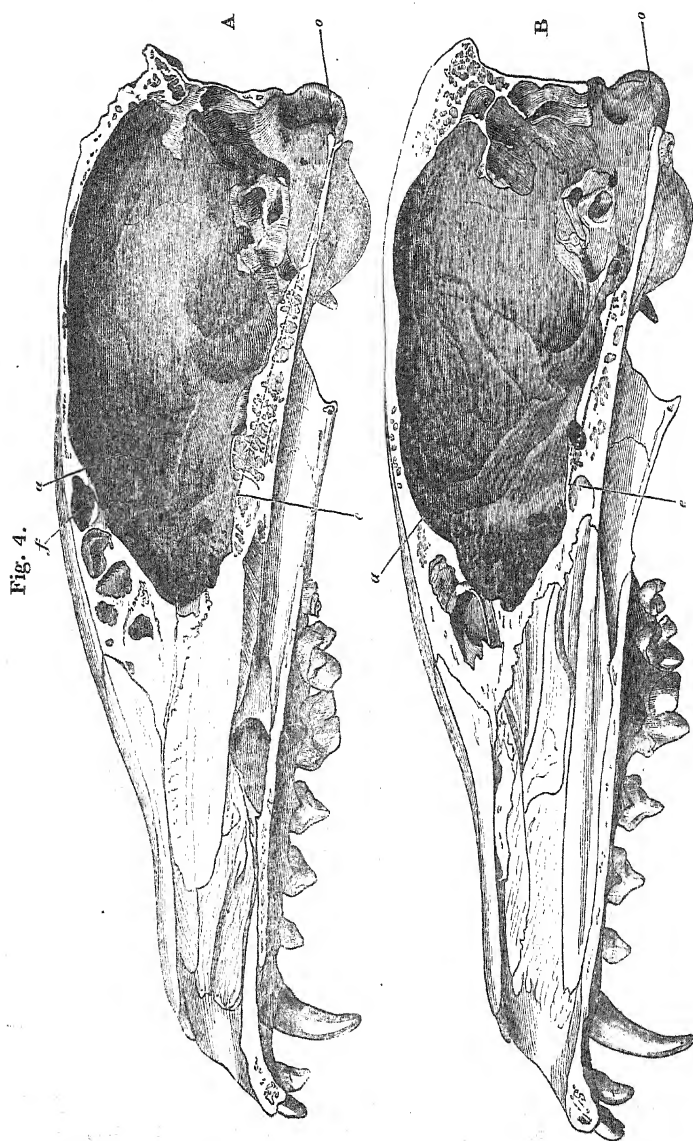
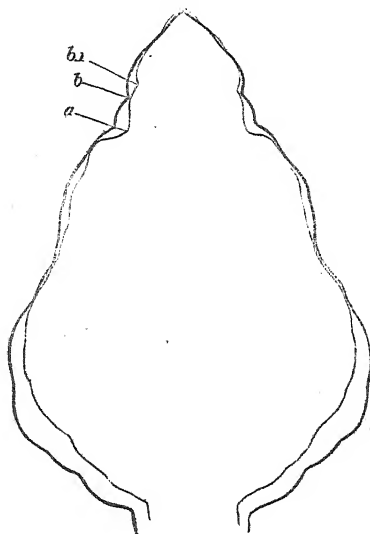


Fig. 4.

Longitudinal sections of the skulls of *C. azarae* (A) and *C. vulpes* (B).  
 o o, orbito-frontal ridge; f, frontal sinus; a, basicranial axis.

rally the contour-line is undulated, presenting one slight incurvation in the region of the sylvian sulcus and another in that of the supra-orbital sulcus (fig. 5, *a*), while a little angulation (fig. 5, *b*, *b'*) marks the junction of the olfactory lobes with the cerebral hemispheres. In *Canis azaræ* the cerebral hemispheres immediately behind the supraorbital fissure widen out abruptly (fig. 5, *a*), and the lateral contour, instead of being slightly incurved at this point, presents a sharp rectangular inflection. The frontal lobe anterior to the supra-orbital sulcus is much longer in *C. azaræ* (*a-b'*) than in *C. vulpes* (*a-b*); and the brain is considerably wider behind in the latter.

Fig. 5.



Superimposed outlines of the casts of the cranial cavities of *C. azaræ* and *C. vulpes*, viewed from above. The thin line belongs to the former, the thick line to the latter.

*a*, the supraorbital sulcus; *b*, the junction of the olfactory lobe with the cerebral hemisphere in *C. vulpes*; *b'*, in *C. azaræ*.

Thus, notwithstanding the extremely close resemblance of these two skulls, there is a very readily discernible difference between them in the presence of frontal sinuses and the peculiar character of the anterior part of the cranial cavity in *C. azaræ*, while both these features are absent in *C. vulpes*. These differences have nothing to do with size or age, inasmuch as the two skulls are almost identical in size and are both fully adult. Nevertheless I do not know that I should have been disposed to attach any great importance to such characters, if I had not found, on examining a large number of canine animals, that they may be disposed in two



groups, in one of which the peculiarities of *Canis vulpes*, while in the other those of *C. azaræ* are always to be met with.

Similar to *C. vulpes* are *C. fulvus*, *C. argentatus*, *C. cinereo-argentatus*, *C. littoralis*, *C. niloticus*, *C. caama*, *C. zerda*, *C. lagopus*; and, on the other hand, *C. lupus*, all varieties of *C. domesticus*<sup>1</sup>, *C. aureus*, *C. anthus*, *C. latrans*, *C. antarcticus*, *C. magellanicus*, and *C. cancrivorus* have the characters of *C. azaræ*.

We are thus enabled to distinguish two series of Canidæ, the one of which may be termed *Alopecoid* and the other *Thooïd*.

The figures of the late Prof. Gervais, "Mémoire sur les formes cérébrales propres aux animaux carnivores" (Nouvelles Archives du Muséum, tome vi.), prove that the Thooïd character of the brain obtains in *C. aureus*, *C. simensis*, *C. lupus*, *C. dingo*, *C. sumatrensis*, *C. princeps*, *C. jubatus*, and *Lycaon pictus*; while the Alopecoid features are very obvious in the Fennec.

4. But within each of these series there are considerable modifications, which give rise to corresponding terms in the two series.

The first of these modifications appears in the proportion of the sectorial and next following teeth relatively to the basiscranial axis (=100), shown by the following table in six examples of the Alopecoid series:—

TABLE III.—*Proportional Measurements of the Teeth in Alopecoids.*

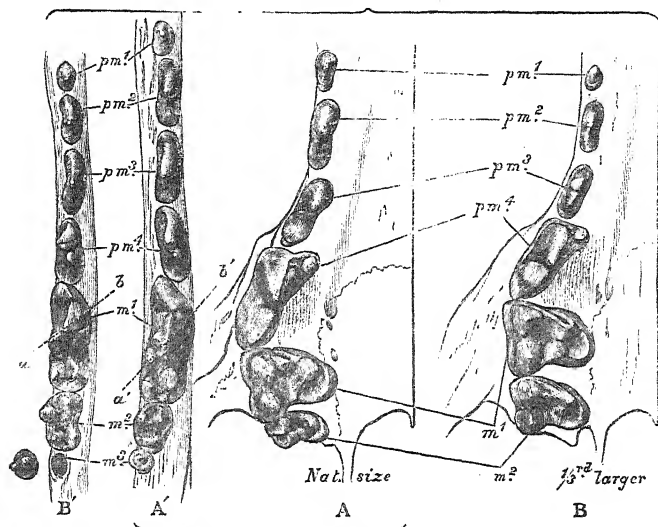
	A.			B.			
	1. <i>C. zerda.</i>	2. <i>C. littoralis.</i>	3. <i>C. famelicus.</i>	4. <i>C. vulpes.</i>	5. <i>C. niloticus.</i>	6. <i>C. argentatus.</i>	
Length of $\frac{pm.4}{m.1}$ ..	20.6	22.4	23.5	27.3	28.3	28.5	1:6
$\frac{m.1}{m.1}$ ..	17.3	18.1	18.	19.4	19.4	20.5	1:1.18
$\frac{m.1}{m.1}$ ..	24.	27.2	28.	30.5	31.1	34.4	1:1.43
$\frac{m.2}{m.2}$ ..	14.	15.7	13.5	14.7	14.4	15.0	1:1.07

These measurements represent individual specimens; and it must be recollected that others might vary considerably on either side of the proportions here given. But they suffice to prove, firstly, that in the group A the sectorial teeth are relatively smaller than in the group B, so that it may be convenient to speak of the one as *microdont* and the other as *macrodont* Alopecoids; secondly, while  $\frac{pm.4}{m.1}$ ,  $\frac{m.1}{m.1}$ , and  $\frac{m.2}{m.2}$  all become larger between *C. zerda* and *C. argentatus*, the increase is far greater on the part of  $\frac{pm.4}{m.1}$  than on that of  $\frac{m.1}{m.1}$ , and of  $\frac{m.1}{m.1}$  than on that of  $\frac{m.2}{m.2}$ . Thirdly, while in *C. zerda*  $\frac{m.1}{m.1}$  is to  $\frac{pm.4}{m.4}$  as 1:1.19 and  $\frac{m.2}{m.2}$  to  $\frac{m.1}{m.1}$  as 1:1.71, in *C. argentatus* the former proportion is 1:1.39 and the latter as 1:2.26. In

<sup>1</sup> In a skull of a Blenheim Spaniel the frontal sinuses are totally absent, but the disposition of the orbito-frontal ridge is exactly as in other domestic Dogs. I do not know whether this peculiarity is general in the Blenheim breed or not.

other words, in the macrodont Alopecoids these teeth are not merely larger but they are more differentiated, the sectorial teeth becoming increased out of proportion to the rest.

Fig. 6.



The crowns of the cheek-teeth of *C. argentatus* (A, A') and *C. littoralis* (B, B').

Those of *C. argentatus* are of the size of nature; those of *C. littoralis* are enlarged in the proportion of 4:3, and consequently are larger by one third than the natural size. This enlargement has the advantage of giving the same length to  $m^1$  in both, and thus enabling the relative dimensions of the teeth to be seen. At the same time, inasmuch as the length of the basicranial axis in the skull of *C. argentatus* is to that in *C. littoralis* as about 4:3, the figures fairly represent the actual morphological relations of the teeth.

$a$   $b$ ,  $a'$   $b'$ , cusp-lines of the lower sectorial teeth. The third lower molar in B' was absent, and is figured from another specimen; its crown is seen somewhat obliquely.

Similar relations are observable in the Thoooid series, as the following table of proportional measurements clearly shows:—

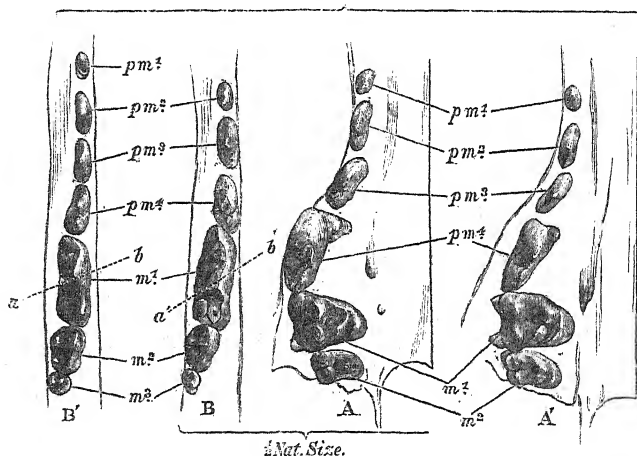
TABLE IV.—Proportional Measurements of the Teeth in Thoooids.

Length of	A		B			1:5
	1. <i>C. azaræ</i> (a).	2. <i>C. magellanicus</i> .	3. <i>C. azaræ</i> .	4. <i>C. dingo</i> .	5. <i>C. lupus</i> .	
$pm^4$ ..	22.4	24.4	26.3	30	32.5	1:1.45
$m^1$ ..	17.7	15.9	19.4	20	23.2	1:1.31
$m^1$ ..	27.7	26.5	30.0	33.2	36.9	1:1.33
$m^2$ ..	14.4	12.2	15.7	14.4	17.1	1:1.18

In this series  $\frac{pm.4}{m.2}$  and  $\frac{pm.1}{m.2}$ , as before, increase out of proportion to the rest, and  $\frac{pm.2}{m.2}$  undergoes the least alteration; but the upper sectorial increases rather more than the lower, which is the reverse of the relation which obtains in the Alopecoid series.

5. In all young canine animals, the upper edges of the attachments of the temporal muscles are separated by a wide interspace of a lyrate form, with its apex directed posteriorly, which may be called the *sagittal area*. The boundaries of this area are but little raised; and, as age advances, it becomes gradually diminished by the approximation of the temporal muscles. This approximation takes place

Fig. 7.



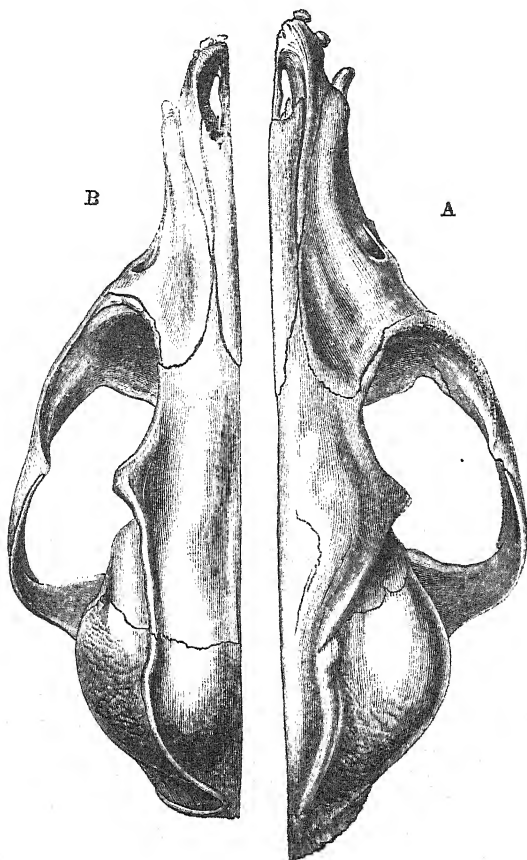
Upper (A) and lower (B) cheek-teeth of *C. lupus*, half the natural size; upper (A') and lower (B') teeth of *C. azaræ* (a), of the natural size. The first upper molars are thus brought to the same length, and the proportional increase of size of the sectorial teeth of the Wolf is apparent.

more rapidly behind than in front, and results in the narrowing, and in most cases coalescence, of the temporal ridges throughout the greater part of the length of the sagittal suture, while in front they diverge to the supraorbital processes and inclose the glabellar area.

In the smaller Alopecoids, such as *C. zerda*, the temporal ridges remain permanently separate, and inclose a wide lyrate sagittal area, the ridges themselves not being very strongly marked; but in *C. littoralis* and *C. cinereo-argentatus* (= *C. virginianus*) the ridges take the form of strongly-raised cord-like elevations, which impart a very characteristic aspect to the skull (fig. 8, p. 251). In this case there is no sagittal crest. But sometimes there is a well-defined though comparatively narrow sagittal area, from the centre of which a low sagittal crest rises. This is well seen in some Jackals, and especially in *C. antarcticus*.

6. In most of the Alopecoids, the contour of the inferior margin of the angular process continues the direction of that of the inferior margin of the ramus in front of it; and this slopes gradually upwards and backwards. In *C. littoralis* and *C. cinereo-argentatus*, however, the inferior contour of the ramus in the region of the

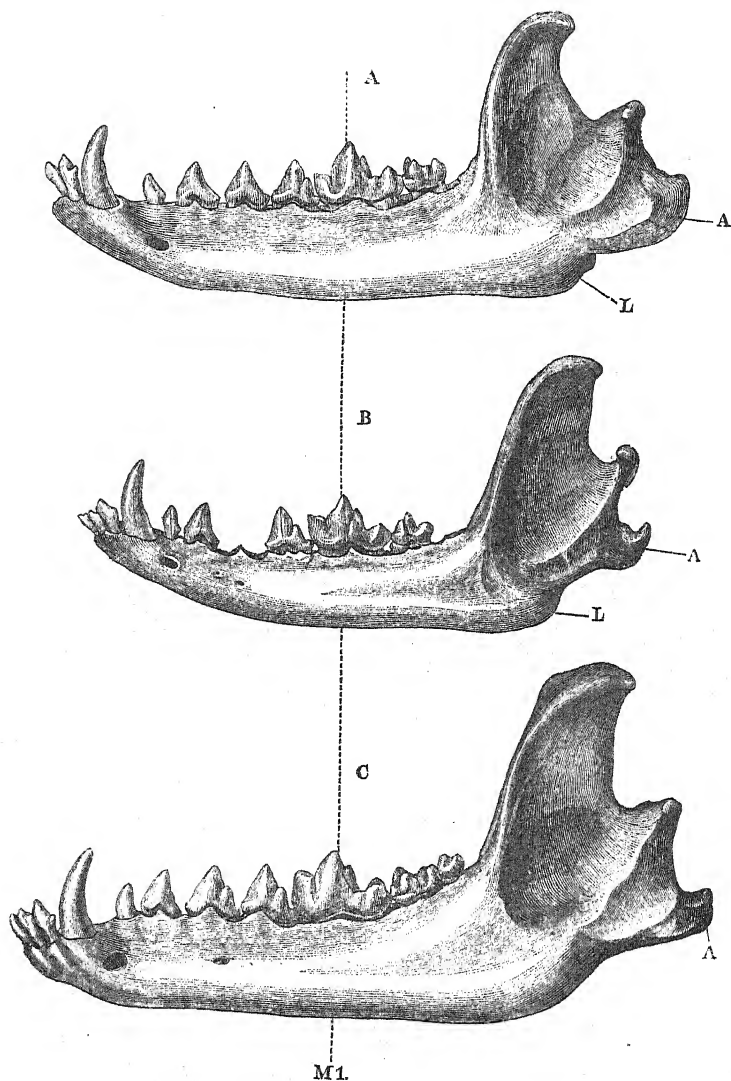
Fig. 8.



A. Dorsal aspect of the right half of the skull of *C. azare* (a); B. the same of the left half of *C. littoralis*: of the natural size.

attachment of the digastric muscle, in front of the angular process, is inclined almost at right angles to the latter, and forms a sort of rounded "subangular lobe" beneath the angular process.

Fig. 9.



The left ramus of the mandible.

A. *C. azare* (a); B. *C. littoralis*; C. *C. fulvipes*: of the natural size.

A. angular process; L. subangular lobe.

De Blainville long since figured and called attention to this feature of the mandible in *C. cinereo-argentatus*.

These peculiarities are closely reproduced in the Thoooid series, by the skull of a South-American animal referred to *Canis azaræ*<sup>1</sup>, which died in the Gardens of the Society, and to which I have alluded above as *C. azaræ* (a) (fig. 8 A, p. 251). The sagittal area is wide and lyrate; but the temporal ridges are not so strongly marked as in *C. littoralis*. There are no strong depressions on the supraorbital processes; and the glabella is evenly arched, in correspondence with the small but distinct frontal sinuses. The angular process of the mandible is extremely strong, and its margin is thick and tumid. Beneath it there is a well-developed subangular lobe (fig. 9 A, L).

The following table of proportional measurements (basicranial axis = 100) shows how closely *C. azaræ* (a) and *C. littoralis* represent one another.

TABLE V.—*Proportional Measurements of the Skull and Teeth of C. azaræ (a) and C. velox.*

	<i>C. azaræ</i> (a).	<i>C. velox.</i>
Total length of bony palate.....	125	122
„ breadth of „ .....	78·9	71
„ length of $\frac{pm. 4}{m. 1}$ .....	22·4	22·4
„ „ $\frac{m. 1}{m. 2}$ .....	17·7	18·1
„ „ $\frac{m. 2}{m. 1}$ .....	11·1	13·3
„ „ $\frac{m. 1}{m. 2}$ .....	27·7	27·2
„ „ $\frac{m. 2}{m. 1}$ .....	14·4	15·7

In both, a small accessory cusp is developed on the posterior part of the outer face of the external anterior or principal cusp of the lower sectorial tooth (fig. 9, A and B).

Nevertheless the frontal sinuses and the form of the anterior part of the cerebral cavity at once distinguish *C. azaræ* (a), as a Thoooid, from *C. littoralis*.

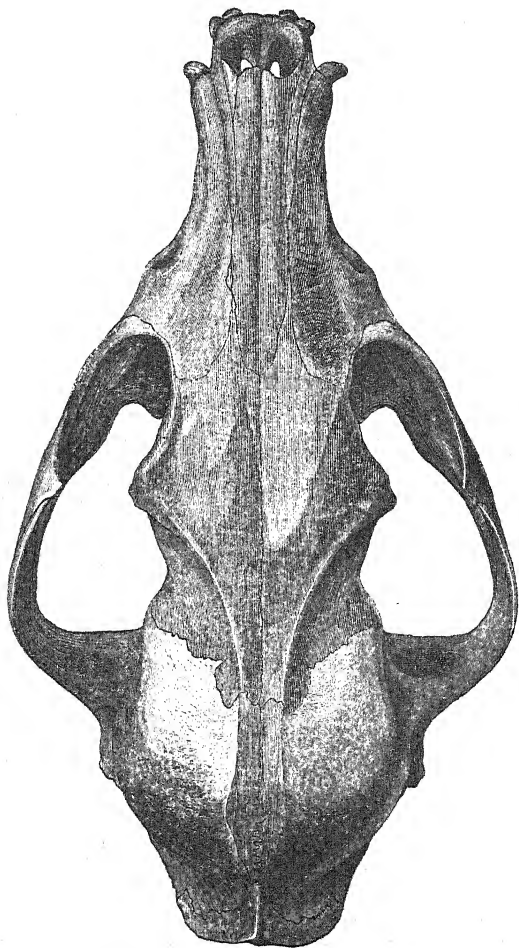
7. The transition between *C. azaræ* (a) and the macrodont Thoooids is furnished by the skull of an animal from Pernambuco, which died in the Gardens, and came to me labelled "*C. fulvipes*" (fig. 10, p. 254). The sagittal area is much narrower than in *C. azaræ* (a); and the temporal ridges unite into a short median crest behind. The glabella is convex, and the postorbital constriction small, in correspondence with the considerable development of the frontal sinuses. The angular process of the mandible (fig. 9, C, A) is deep, strong, and thick, but not tumid as in the foregoing species. The subangular lobe is

<sup>1</sup> Mr. Forbes informs me that this animal possessed a short straight cæcum. *C. cancrivorus* has a similar cæcum. In *C. procyonoides*, *C. jubatus*, and *Icticyon venosus* the cæcum is longer and larger, but almost straight. In all the other Canidæ (certainly in *C. lupus*, *C. laniger*, *C. domesticus*, *C. aureus*, *C. anthus*, *C. antarcticus*, *C. azaræ*, in *Cyon*, *Lycæon*, *Vulpes*, and *Otocyon*) it would appear that the cæcum is large and coiled. (See Garrod, P. Z. S. 1873 and 1878; Murie, P. Z. S. 1873; Flower, P. Z. S. 1880.)

far less developed; hence the inferior contour of this part of the jaw is not very much more prominent than it is in some of the Jackals.

I cannot distinguish the skull of this "*C. fulvipes*" from that

Fig. 10.



Dorsal view of the skull of *C. fulvipes*.

figured by De Blainville ('Ostéographie,' *Canis*, pl. viii.) under the name of *Canis cancrivorus*, from Cayenne—nor from the *C. cancrivorus* of Burmeister, which appears to be identical with the *C. bra-*

*siliensis* of Lund. Under these circumstances I presume that it should be named *C. cancrivorus*.

Another skull of a male animal which died in the Gardens has unfortunately lost its mandible. It is labelled "*C. cancrivorus*," and differs from the foregoing only in having a much broader sagittal area, with slightly larger teeth and broader and longer palate in proportion to the basicranial axis (though not absolutely) than the foregoing.

A third skull, also labelled "*C. cancrivorus*," ♀, is young, with the milk-teeth not yet shed. The permanent first molars above and below are just coming into place; and their actual dimensions are so nearly identical with those of the preceding skulls, that, though the mandible has not quite the characteristic degree of lobation, I am disposed to think that the differences which exist depend merely on age.

8. If the measurements of the skulls of *C. azaræ* (a), *C. cancrivorus*, and *C. azaræ* be now compared with one another and with those of *C. aureus*, *C. anthus*, and *C. lupus*, they will be found to form a gradual series of modifications.

TABLE VI.—*Proportional Measurements of the Skulls and Teeth of Thoooids.*

	<i>C. azaræ</i> (a).	<i>C. cancri-</i> <i>vorus</i> .	<i>C. azaræ</i> .	<i>C. aureus</i> .	<i>C. an-</i> <i>thus</i> .	<i>C. lupus</i> .
Length of basicranial axis .....	100	100	100	100	100	100
Length of $\frac{pm. 4}{m. 1}$ .....	22.4	25.5	26.3	27	30	32.5
" " $\frac{m. 1}{m. 2}$ .....	17.7	20.8	19.4	21.4	20.4	23.2
" " $\frac{m. 2}{m. 1}$ .....	11.1	12.5	12.1	12	13.6	12.5
" " $\frac{m. 1}{m. 1}$ .....	27.7	29.1	30	30.9	34	36.9
" " $\frac{m. 2}{m. 2}$ .....	14.4	15.6	15.7	17.1	16.3	17.1
" " palate .....	125	125	150	124	137	146
Breadth of palate ...	78.9	79	85	94	95	99

The only considerable break in the regularity of the progression here arises from the large size of  $\frac{m. 1}{m. 2}$  in *C. cancrivorus* and the unusual length of the palate in *C. azaræ*. This regularity, however, is fortuitous. The measurements here given are those of individual skulls; and if several individuals of any given species are measured in the same way, the range of variation in some cases is remarkable. Thus, three specimens of the Indian Jackal yield the following results (basicranial axis=100):—



TABLE VII.—*Proportional Measurements of Teeth and Palate of Canis aureus.*

	I.	II.	III.
Length of $\frac{pm. 4}{m. 1}$ . . . . .	27	31	33·8
„ „ $\frac{m. 1}{m. 2}$ . . . . .	22	24	21·6
„ „ $\frac{m. 2}{m. 1}$ . . . . .	12	12·2	13·2
„ „ $\frac{m. 1}{m. 2}$ . . . . .	30·5	34	35·8
„ „ $\frac{m. 2}{m. 3}$ . . . . .	17	16·9	16·6
„ „ $\frac{m. 3}{m. 2}$ . . . . .		7·5	7·5
Length of palate . . . .	125	141	143
Breadth of palate . . . .	94	90	90

The actual dimensions in millimetres are as follows :—

TABLE VIII.—*Cranial and Dental Measurements of Canis aureus.*

	I.	II.	III.
Length of basicranial axis. .	59	53	53
„ $\frac{pm. 4}{m. 1}$ . . . . .	16	16·5	18
„ $\frac{m. 1}{m. 2}$ . . . . .	13	13	11·5
„ $\frac{m. 2}{m. 1}$ . . . . .	7	6·5	7·1
„ $\frac{m. 1}{m. 2}$ . . . . .	18	18	19
„ $\frac{m. 2}{m. 3}$ . . . . .	10	9	9
„ $\frac{m. 3}{m. 2}$ . . . . .		4	4
„ palate . . . . .	74	75	76
Breadth of „ . . . . .	56	48	48

The comparison of these two tables is interesting; for, according to the first, the variations of the dimensions of the teeth in proportion to those of the basicranial axis cover the whole range between *Canis azaræ* and the Wolves; on the other hand, the second shows that, while the basicranial axis, doubtless following the actual size of the animal, varies considerably, and while the teeth also vary, the two sets of variations do not correspond: hence, in the proportional table, the differences in the sizes of the teeth appear to be greater than they really are.

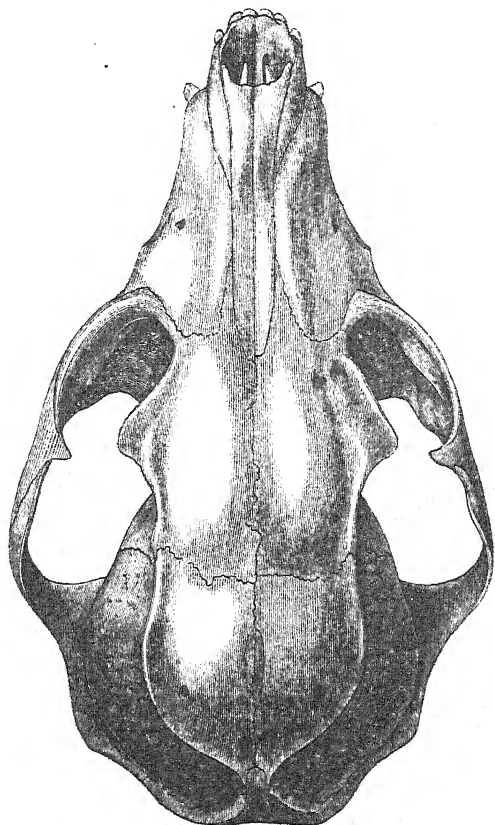
Similar results are attained when the measurements of any considerable number of specimens of other canine skulls are compared. In fact, while in both the Thoooid and the Alopecoid series the species may be arranged in a scale characterized by the gradually increasing relative and actual dimensions of the sectorial teeth, each species occupies not a line but a broad zone upon that scale, which zone is overlapped by that of the species below and by that of the species above.

9. The lowest Alopecoids and the lowest Thoooids agree in the relatively small size of their sectorial teeth; and many possess a large lyrate sagittal area and a strongly lobate mandible. The genus

*Otocyon* shares the last two peculiarities, and exhibits the first in a more marked degree than any other known canine animal, recent or extinct.

There are three skulls of this interesting form in the Museum of the Royal College of Surgeons, and three in the British Museum; and they all agree very closely with the figures and description given by De Blainville.

Fig. 11.



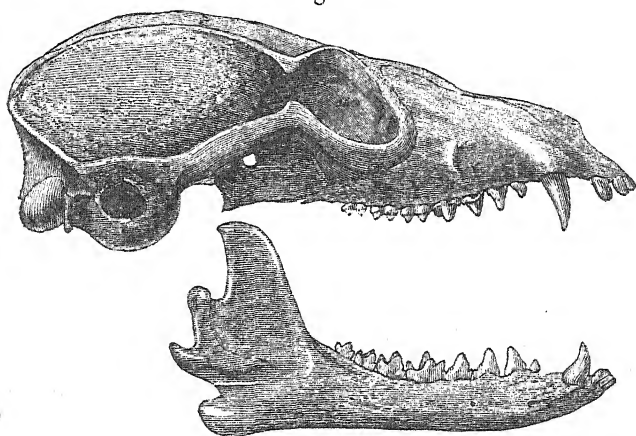
Dorsal view of the skull of *Otocyon lalandii*: nat. size.

In all, the posterior ends of the nasal bones extend beyond the fronto-maxillary suture; but they vary considerably in width. The frontal processes are well separated from the ascending processes of the præmaxillaries. The temporal ridges are much stronger and the sagittal area narrower in one skull, which appears to be the oldest. There are no frontal sinuses. In all, the subangular lobe of the

mandible is very strong, thickened, and more or less incurved at its free margin. The angular process is strong, and projects inwardly as a horizontal shelf-like prominence, which is concave above, so that it somewhat resembles the bowl of a spoon (fig. 14, C, p. 263).

The posterior margin of the bony palate lies considerably behind the line of the hindmost molars. The line of the cheek-teeth is not angulated at the junction of the upper sectorial with the first molar, but nearly straight and almost parallel with that of the opposite side (fig. 13, B, p. 260). The incisive foramina are prolonged forwards into deep grooves on the palatal surfaces of the præmaxillæ. The

Fig. 12.

Lateral view of the skull of *Otocyon lalandii*:  $\frac{2}{3}$  nat. size.

incisor teeth have different proportions from those of ordinary Canidæ, the outer being relatively smaller and less different from the rest. The outer upper incisor, on each side, is separated by an interval from the second.

The great difference between *Otocyon* and all the other Canidæ, however, lies not merely in the increased number of the molar teeth, but in the proportions of the teeth to the basicranial axis and to one another, and in the low development of the jaws. The following table gives the average of three of the skulls:—

TABLE IX.—*Proportional Measurements of the Skull and Teeth in Otocyon.*

Basicranial axis	.....	100 (average absolute length 42 mm.).
Length of $\frac{pm. 4}{m. 1}$	.....	12.7
„ $\frac{m. 1}{m. 2}$	.....	13.4
„ $\frac{m. 2}{m. 3}$	.....	11.8

Length of $\overline{m.1}$ . . . . .	16.1
„ $\overline{m.2}$ . . . . .	13.3
„ $\overline{m.3}$ . . . . .	9.8
„ palate . . . . .	138
Breadth of palate . . . . .	66

Thus the upper jaw is both short and narrow; and the slenderness of the rami of the mandible is not less remarkable, though in this respect *C. cancrivorus* and *C. procyonoides* approach *Otocyon*.

TABLE X.—*Cranial and Dental Measurements of Otocyon lalandii.*

	I.	II.	III.	IV.	V.	VI.
Total length . . . . .	114	123	112	113	112	
Length of palate . . . . .	57	61	53	54	58	59
Breadth „ . . . . .	28	26	27	27	29	27
Length of basiscranial axis . . . . .			40	41	43	41
Length of $\overline{pm.4}$ . . . . .	5.7	6.5	5.5	5.3	5.5	5
Breadth „ in front . . . . .	5	5.5	5.8	4.7	5	4
Length of $\overline{m.1}$ . . . . .	5	5.5	5	5.5	6	5
Breadth „ . . . . .	6.2	8	7	6	7	6.5
Length of $\overline{m.2}$ . . . . .	5	5.5	5	5	5	4.5
Breadth „ . . . . .	6.5	8	7	6.5	6.5	6.5
Length of $\overline{m.3}$ . . . . .	4.5	5	4	3.5	4.5	4
Breadth „ . . . . .	6	6	6	5	5.5	5.5
Length of $\overline{m.4}$ . . . . .						4
Breadth „ . . . . .						4
Length of $\overline{m.1}$ . . . . .	6	7	6.5	6.5	7	6
„ $\overline{m.2}$ . . . . .	6	6	6	5.5	6	5
„ $\overline{m.3}$ . . . . .	5	6	5	4.3	4.5	4
„ $\overline{m.4}$ . . . . .	3.5	4	3	3	3.3	*

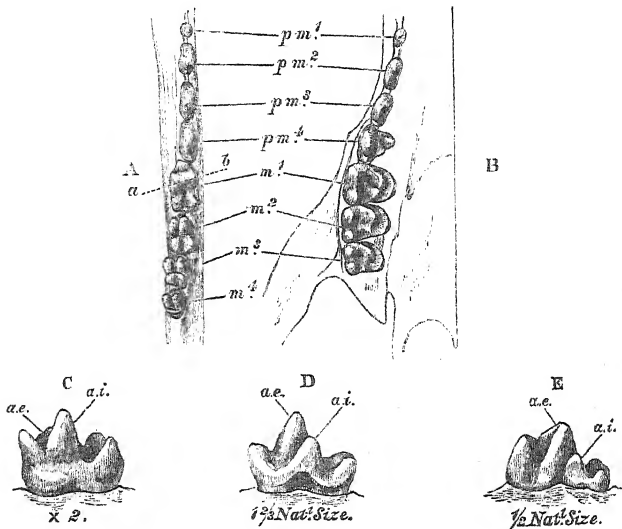
On inspection of the foregoing tables of the actual and the proportional measurements of the skulls and teeth, the wide differences between *Otocyon* and all the other Canidæ become apparent.

Confining our attention for the present to those teeth in *Otocyon* which answer to those met with in other Canidæ, it is obvious that the sectorial teeth are much smaller in proportion to the basiscranial axis, that the difference between  $\overline{m.1}$  and  $\overline{m.2}$  and  $\overline{m.3}$  is much less, and that  $\overline{pm.4}$  is never greatly longer and may be shorter than  $\overline{m.1}$ .

\* Fallen out on both sides.

The patterns of the crowns of the upper cheek-teeth (fig. 13, B) are completely canine. The anterior inner cusp of the fourth upper præmolar is very thick and prominent, and gives the crown of the tooth the form of an almost equilateral triangle. There is a well-developed secondary cusp at the anterior end of the base of the principal cusp of this tooth, so that, viewed from the outside, it appears tricuspidate; and sometimes there is a minute cusp behind

Fig. 13.



A, lower, and B, upper cheek-teeth of *Otocyon lalandii*; the last molar in the upper jaw is absent; C, the lower sectorial tooth of *Otocyon* from the inner side, of twice the natural size; D, the corresponding tooth of *C. zerda*, and E, of *C. lupus*, reduced to the same absolute length and also viewed from the inner side; *a.e.* anterior external cusp; *a.i.* anterior internal cusp; *a.b.* cusp-line. The tooth of the Fennec is obviously intermediate in character between that of *Otocyon* and that of the Wolf. The comparison of these figures with figs. 6 and 7 will give a very good conception of the extent and the nature of the modifications of the cheek-teeth in the Canidæ.

the principal inner cusp. In both points this tooth approaches the upper sectorial of *Nasua*. The crowns of the molars are broader than they are long; but the difference is less than in most Canidæ. Their four cusps, with the cingulum on the inner side, are very distinct; and the second upper molar is much larger in proportion to the first than in other Canidæ.

In the mandible, the third præmolar has a sharp cusp at the anterior end of its base; the first molar has the inner cusps higher than the outer ones; and the anterior paired cusps are set in a nearly transverse line, the inner hiding the outer when the tooth is viewed from within (fig. 13, C). In both these respects the crown of this tooth

differs from that of other Canidæ and approaches the characters of the same tooth in the Viverridæ and, especially, in the Procyonidæ.

It is obvious that, in all these features, *Otocyon* represents a lower term in the series of the Alopecoids than *C. cinereo-argenteus* and *C. velox*; and although the interval between these and *Otocyon* is as wide as that between *C. velox* and *C. vulpes*, there would be no reason for separating *Otocyon* from the rest of the group were it not for the extraordinary excess in the number of molar teeth. Of these there are four on each side above in one specimen, three in the others, four on each side below in all. So far as any conclusion can be drawn from this limited number of examples, therefore, it would appear that the presence of the fourth upper molar is exceptional; and that the dentition is tending towards a higher type by its suppression. The crowns of the hindmost upper molars, in the one specimen in which they are shown, are of a triangular shape, the base of the triangle corresponding with the two distinct external cusps. On the inner side only one cusp remains. The crown of the small fourth lower molar exhibits two well-developed cusps, of which the outer is rather the smaller. These apparently represent the anterior cusps of the other molars, as the posterior pair of cusps are proportionally smaller than the anterior pair in the third molar.

10. The facts now adduced appear to me to permit of the arrangement of the Canidæ hitherto considered in the following manner:—

#### CANIDÆ.

##### I. *Molars* $\frac{2.2}{3.3}$ .

##### A. Alopecoids.

##### B. Thoooids.

##### a. Macrodon'ts.

Ex. *C. argentatus*.  
*C. vulpes*.

Ex. *C. lupus*.  
*C. aureus*.

##### b. Microdon'ts.

##### a. Mandible nonlobate.

Ex. *C. caama*.  
*C. zerda*.

Ex. *C. azaræ*.  
*C. vetulus*.

##### β. Mandible lobate.

Ex. *C. littoralis*.

Ex. *C. cancrivorus*.

##### II. *Molars* $\frac{4.4}{4.4}$ .

*C. Otocyonoids*.  
*Otocyon*.

It will, however, be readily understood from what has already been said, that it is not intended to suggest the possibility of sharply separating the macrodont from the microdont forms, or those with lobed mandibles from those with mandibles of the ordinary character. On the contrary, they pass into one another; while the lower Thoooids,

with small frontal sinuses, are so slightly separated from the lower Alopecoids, that it is hard to say whether we have any right to look for a Thooïd representative of *Otocyon* or not. It is quite as reasonable to suppose that *Otocyon* is the nearest living representative of the primitive type of the Canidæ, whence all the rest have been derived, in the first place, by the differentiation of the Thooïd from the Alopecoid series, and, in the second, by the occurrence of corresponding series of modifications leading up to the Fox on the one hand and to the Wolf on the other.

11. If this view of the facts is correct, the key to the morphological relations of the whole of the Canidæ must lie in the determination of the affinities of *Otocyon*. The facts hitherto considered primarily appear to me to suggest looking in two directions—in the first place towards the Procyonidæ, and in the second towards the Didelphiæ.

In studying the Canidæ it is impossible not to be struck by the wonderful persistency of the fundamental patterns of the sectorial teeth and of those which follow them. This singular uniformity can hardly be accounted for by adaptation to similar modes of life; for the pattern is as distinctly marked in *C. jubatus* and *C. procyonoides*, which live largely upon fruits and roots and never attack large animals, as in any of the more purely carnivorous Canidæ. It must therefore be regarded as a morphological fact of fundamental importance, and the best guide to the immediate affinities of this group of animals.

Now, in *Bassaris* we have a procyonine form, the teeth of which are extraordinarily similar to those of *C. zerda*, if we suppose the little posterior lower molar of the Fennec suppressed. The posterior margin of the bony palate is on a level with the hindermost molar teeth, and therefore does not extend further back than in the ordinary Canidæ. There are no frontal sinuses; and the ethmoid is high. In *Ælurus*, again, the patterns of the teeth are essentially canine, though inclining in some respects towards the Bears: the frontal sinuses are large, the ethmoid low, and the cranial cavity has a completely Thooïd contour. In this genus, as Prof. Flower has pointed out, an alisphenoid canal is present. The small flattened bulla, with its long meatus, is unlike that of the Dogs; on the other hand, the carotid canal is long, and its posterior aperture opens into a depression common to it and the foramen lacerum posterius. The bony palate extends considerably further back than in any existing canine animal.

In *Nasua* the fourth premolar above is triangular; but a small second inner cusp is beginning to appear behind the large one. In *Procyon* this cusp has increased so much that the crown of the tooth is quadrangular. In this genus there is a small cingulum on the inner side of the first and second molars, which thus retain a resemblance to those of the Dog. In *Nasua*, however, it is no longer visible. In both these genera a line joining the inner and outer cusps of the lower sectorial teeth is almost transverse to the axis of the tooth, and the inner cusp is higher than the outer, as in *Otocyon*.

I find the proportional lengths of the teeth in *Nasua* and *Procyon* to be as follows:—

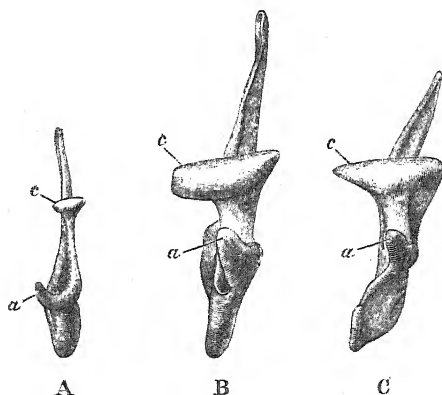
TABLE XI.—*Proportional Lengths of the Teeth in Procyonidæ and Otocyon.*

	<i>Nasua.</i>	<i>Procyon.</i>	<i>Otocyon.</i>
Length of $\frac{pm.4}{m.1}$ . . . . .	16·6	16·6	12·7
„ $\frac{m.1}{m.2}$ . . . . .	17·7	17·7	13·4
„ $\frac{m.2}{m.1}$ . . . . .	16	12·7	11·8
„ $\frac{m.1}{m.2}$ . . . . .	18·8	20·5	16·1
„ $\frac{m.2}{m.1}$ . . . . .	20	19·4	13·3

The teeth of *Nasua* and *Procyon* are larger (and notably thicker) than those of *Otocyon*; moreover the hindermost molars, in their elongation and in other characters, tend towards the Ursine form. There is therefore no question of direct affinity between *Nasua* and *Procyon* and *Otocyon*; it is simply that, in dental characters, the lowest type of canine animal approaches the less-differentiated Procyonidæ.

In *Bassaris* and in *Procyon* the form of the ramus of the mandible is similar to that in the ordinary Canidæ; in *Nasua* it approaches

Fig. 14.



Right ramus of the mandible of *Perameles* (A), *Procyon* (B), and *Otocyon* (C), from behind: a, angular process; c, condyle.

that seen in *C. cancrivorus*; in *Ælurus* this peculiarity is still more exaggerated; and in *Cercoleptes* we have a mandible which resembles that of *Otocyon*, with a still more developed lobe. As to the base of the skull, it appears to me that, taking *Ælurus*, *Procyon*, and *Nasua* together, the arctoid characters are so modified, and the approximation to the canine type of skull becomes so close, that they almost present a transition from the one type of skull to the other.

I have elsewhere drawn attention to the fibrous epipubis of the Dogs as the homologue of the so-called "marsupial bone" of the



Didelphia and Ornithodelphia<sup>1</sup>, and other indications of the approximation of the lower Carnivores to the *Didelphia* are not wanting.

If the mandibles of *Otocyon*, of *Procyon*, and of *Perameles* are viewed from behind (fig. 14, p. 263), it will be seen that the angular process is as distinctly inflected in the two former as in the latter, and that the difference in the angular process of *Thylacinus* is merely one of the degree of development of a homologous and similarly formed part<sup>2</sup>.

I look upon the four molars of *Otocyon* as another character of the same order; as a survival, in fact, of a condition of the dentition exhibited by the common ancestors of the existing Canidæ and the existing carnivorous marsupials.

12. The geographical distribution of the Canidæ presents many points of interest when it is considered in relation to the morphological characters of the forms at present restricted to certain areas of the earth's surface.

*Otocyon* occurs only in South Africa, and apparently does not range beyond the southern extremity of that continent.

The microdont Alopecoids with lobate jaws (*C. cinereo-argentatus* and *C. littoralis*), which have been separated by Baird under the name of *Urocyon*, appear to me to be the nearest existing allies of *Otocyon*. But there is no representative of this group outside the North-American continent, *C. cinereo-argentatus* occupying the central States of North America, while *C. littoralis* occurs on the N.W. in California, and on the south as far as Honduras and Costa Rica. Baird suggests that *C. littoralis* is merely a local race of *C. cinereo-argentatus*; and the measurements in Table XII., which show that No. II. is as near to No. III. as to No. I., lend strong support to this view.

The small Foxes of the Old World, *C. zerda* and *C. caama*, differ from the foregoing in little more than the nonlobation of the mandible and the less prominent or cord-like character of the temporal ridges. In *C. bengalensis*, *C. corsac*, and *C. velox* the sagittal area narrows and the temporal ridges unite behind, while the sectorial teeth increase in proportional size, and thus gradually lead to the most specialized Foxes of the Old World.

This is shown very clearly by the following table of measurements of thirteen specimens belonging to twelve species of Alopecoids.

<sup>1</sup> Proceedings of the Royal Society, 1879. I have recently found the epipubis very well developed in a female Bengal Fox and in a female *C. mesomelas*. My friend Dr. Rolleston, F.R.S., has been good enough to compare *Thylacinus* with the domestic Dog; and he informs me that "the bone is disproportionately small in the marsupial in question; but it has precisely the same relation to the external oblique's bifid tendon, to the rectus and pyramidalis (which are only imperfectly differentiated from one another and from the inner or upper division of the tendon of the external oblique), and, finally, to the pectineus, which it has in the placental mammal."

<sup>2</sup> A comparison of the mandible of *Didelphys* with that of *Nasua* is even more instructive. In *Centetes* the angular process is slightly but characteristically inflected.

TABLE XII.—*Cranial and Dental Measurements of Alopecoids.*

	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.	XIII.
Total length.....	97	104	...	84	108	...	112	112	126	...	136	143	146
Length of palate .....	45	51	57	42	50	53	60	60	64	63	67	73	74
Breadth " .....	27	29	34	25	33	30	32	34	40	38	40	41	44
Length of basiscranial axis .....	36	38	45	36	42	39	38	...	44	...	49	46	50
" $\frac{pm.4}{m.1}$ .....	8.5	10	11	8	9	9.5	11	11	12.5	13	13	13	15
" $\frac{m.1}{m.2}$ .....	5.5	7.5	9	6	8	8	7	8	9	8.5	9	9.3	10.5
Breadth " .....	7.5	8.5	6	7.7	10	...	8	8.5	10.5	...	11	11	11.5
Length of $\frac{m.2}{m.1}$ .....	4.5	5.5	6	4	5.5	5	4	4	5	4	5	5	5.5
Breadth " .....	5.5	6.5	...	6	8	...	6	7	7.5	...	7	7.3	7.5
Length of $\frac{m.1}{m.2}$ .....	9.5	11.5	12.5	8.5	11	10	11.5	13.5	14	14	15	15	17
" $\frac{m.2}{m.3}$ .....	5	6	7.5	5	6	6.5	5.5	6.5	6.5	6	7	7.3	7
" $\frac{m.3}{m.4}$ .....	2.6	...	...	2.5	...	3	2	2.6	3	...	3.5	3	3

[Nos. I. and II. *C. littoralis*; No. III. *C. cinereo-argenteatus* (= *virginianus*); No. IV. *C. zerda*; No. V. *C. cutane*; No. VI. *C. bergdensis*; No. VII. *C. corsac*; No. VIII. *C. velox* (the measurements taken from Dr. Baird's figure of the skull of this species); No. IX. *C. nictitans*; No. X. *C. lagopus*; No. XI. *C. fuscus*; No. XII. *C. vulpes*; No. XIII. *C. argentatus*.]

Thus *C. caama*, *C. bengalensis*, *C. corsac*, and *C. velox* appear to be mere local varieties of a small Alopecoid form answering pretty nearly to the Jackals in the Thood series, and occupying the southernmost part of the Alopecoid zone, from South Africa to Central America. The more differentiated Alopecoids, though largely co-existent with these, are preponderant in the north of the zone.

I can meet with no evidence of the existence of any true Alopecoid in South America, which appears to be the head quarters of the lower Thoods.

Among these, *C. vetulus* has the least modified dentition, and in this respect corresponds with *C. littoralis* among the Foxes. This species is figured and fully described by Burmeister. The skull has a low median sagittal crest; and the ramus of the mandible is slender and nonlobate. In the one imperfect cranium which I have seen (from which the measurements in Table XIII. are given) the length of the sectorial and first molar in the upper jaw is the same, and does not exceed 17 per cent. of the basicranial axis. The length of the lower sectorial is rather less than 23 per cent. The crown of the upper sectorial or fourth premolar is broadly triangular (breadth in front 5.5 millims. to length 7 millims.), on account of the great size of its internal cusp, and resembles that of *Otocyon*. The inner anterior cusp of the lower sectorial is lower than the outer; but a line drawn through both is almost transverse to the axis of the tooth, the heel of which is very stout.

In Brazil, in Demerara, and in Guiana the canine animals which have been named *Canis cancrivorus*, *C. fulvipes*, *C. brasiliensis*, *C. rudis*, and that to which I have referred above as *C. azaræ* (a) occur. The crania belonging to the first four which have come under my observation are, for the most part, rather larger than that of the last, have a less-marked subangular lobe and slightly larger sectorial teeth; but there is no sharp line of demarcation between the two sets, and I regard them all as local varieties of *C. cancrivorus*. Moreover, in those forms, such as *C. rudis*, in which the skull is largest, the approximation to *Canis azaræ* (the most widely distributed of the South-American Canidæ) is so close, that I cannot separate the two by any osteological or dental characters.

*Canis magellanicus* presents the same sort of relation to *C. cancrivorus* as *C. sinensis*, in the Old World, bears to *C. aureus* and *C. anthus*. The size of the body, and notably of the jaws, has increased without any corresponding enlargement of the teeth (Table XIII.). In the large relative size of the upper molars, *Canis jubatus* adheres to the same type; while *C. antarcticus*, on the other hand, presents the closest approximation to some specimens of *C. latrans* (Table XIII.).

From the range of variation of *C. cancrivorus*, it can hardly be doubted that the examination of more extensive materials will prove the existence of an uninterrupted series of gradations from *C. vetulus* to *C. antarcticus* and *C. jubatus*. Burmeister<sup>1</sup> remarks that *Canis cancrivorus*, *C. fulvicaudus*, and *C. vetulus* are distinguished by the relative shortness of their jaws from *C. azaræ*, *C. griseus*, and *C.*

<sup>1</sup> Erläuterungen zur Fauna Brasiliens, p. 46.

TABLE XIII.—Cranial and Dental Measurements of South-American Thoboids.

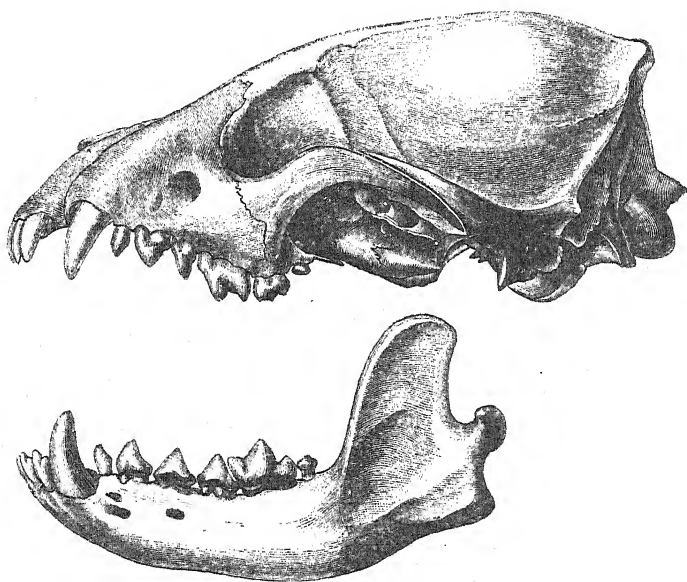
	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.	XIII.	XIV.	XV.	XVI.	XVII.	XVIII.
Total length .....	...	116	132	...	...	124	125	130	119	142	...	187	177	215	160	106	180	174
Length of palate .....	48	57	65	...	...	62	61	66	59	72	64	92	...	108	84	84	92	89
Breadth " .....	29	36	38	...	...	40	39	39	39	41	38	48	...	60	55	53	50	55
Length of basiscranial axis..	42	44	47	...	...	43	49	47	44	48	50	60	61	66	57	56	58	57
" $\frac{pm.1}{m.1}$ .....	7	10	11	11.2	12	11.5	12	12	12	12.5	14	15	15.5	18	18	17	18	19
" $\frac{m.1}{m.1}$ .....	7	8	10	8.5	9.5	9	10	10	10.5	9	10	10	9.5	15	12	11	11.5	12.5
Breadth " .....	8	10	...	...	...	11	11	...	...	11	...	12	...	15.5	14.5	14	14	14.5
Length of $\frac{m.2}{m.2}$ .....	5	5	6	5.7	7	6	6	6	7	5	6	6.5	6.3	10	6.5	5.5	7	6.5
Breadth " .....	6.5	7.5	...	...	...	7.3	7.5	...	...	7	...	10	...	12	9	8	10	8
Length of $\frac{m.1}{m.1}$ .....	9.5	12.5	14	13.2	14	...	14	13.5	14.2	14.3	15	16	16	21.5	19	19.5	19.5	
" $\frac{m.2}{m.2}$ .....	6.5	6.5	7.5	7.2	8	...	7.7	8	8.5	7.5	8	...	8.7	11	8.5	8.5	8.7	
" $\frac{m.3}{m.3}$ .....	3	3.7	4	4	4.5	...	4	4.5	...	3.5	4.5	...	3.2	5.5	4	4	4.5	
" $\frac{m.4}{m.4}$ .....	...	...	2	2.5	...	...	...	...	...	...	...	...	2.5					

[No. I. *C. velatus*; No. II. *C. azure* (v); Nos. III. IV., and V. *C. concoloratus*; No. VI. *C. concoloratus*, referred to above; No. VII. *C. fulvipes*; Nos. VIII. and IX. *C. rubris*; No. X. *C. azure*, described above; No. XI. *C. azure*; No. XII. *C. angulatus*; No. XIII. *C. angulatus*; No. XIV. *C. juba*; No. XV. *C. antarticus*; No. XVI. *C. antarticus*; No. XVII. *C. latrans*; No. XVIII. *C. antarticus*, skull without the mandible. The measurements of a specimen of *C. latrans* are given here to show the extreme closeness of the relation between the "Prairie-Wolf" and its southern analogue.]

*magellanicus*; but, so far as the measurements of his figures of the teeth permit me to form a judgment, *C. griseus* differs in no respect from some specimens of *C. cancrivorus*. With a shorter skull, Burmeister's specimen of *C. magellanicus* has larger sectorial teeth than either of the specimens I have seen.

In the lower jaws of two specimens of *C. cancrivorus*, and in one of *C. magellanicus*, in the British Museum, there is a well-formed though small fourth molar; and in a third specimen of *C. cancrivorus* there is a curious abnormal structure, consisting of a bunch of five minute crowns of teeth (whether united by their roots or not cannot be made out without injuring the specimen) in the place of the fourth lower molar on the right side.

Fig. 15.



Side view of the skull of *Icticyon venaticus*:  $\frac{3}{4}$  nat. size.

Van der Hoeven<sup>1</sup> has described and figured a skull with a third upper molar on both sides, which he ascribes to *C. azaræ*, but which, according to Burmeister, belongs to *C. cancrivorus*.

In *C. cancrivorus*, therefore, the persistence of  $\frac{m. 3}{m. 4}$  seems to be a common occurrence, while  $\frac{m. 3}{m. 4}$  is found occasionally. Thus it would appear that we have under our eyes, in this species, another stage in the modification of the primitive dentition of the Canidæ, which, as

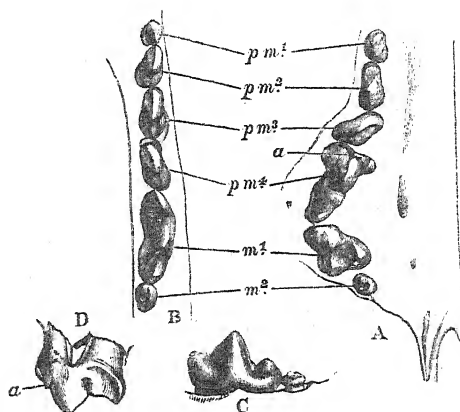
<sup>1</sup> "Over het geslacht *Icticyon* van Lund," Verhandelingen der Koninklijke Akademie van Wetenschappen, Amsterdam, iii. 1856.

we have seen, has commenced even in *Otocyon*. And I think there can be no reasonable doubt that the occasional appearance of an extra molar in domestic dogs is not a monstrosity, but a reversion to the earlier and more complete dentition of the primitive stock of the Canidæ.

In *Icticyon* the dentition is modified in the opposite direction, by the suppression of  $\frac{m.3}{m.3}$  and the reduction of  $\frac{m.2}{m.2}$ . Indeed this tooth was supposed to be absent altogether, until Professor Flower recently observed it in a specimen which has already been the subject of a communication to the Society.

I am greatly obliged to the President for enabling me give a figure of the skull (fig. 15) and teeth (fig. 16) of the specimen in question, which, though not quite fully adult, has the complete permanent dentition.

Fig. 16.



Upper (A) and lower (B) cheek-teeth of *Icticyon venaticus*; C, the right lower sectorial and second molar, from within; D, the right upper sectorial, from within; a, the accessory cusp; the inner anterior cusp is not sufficiently well defined.

In the following table of measurements I add those of an imperfect skull in the British Museum.

TABLE XIV.—*Cranial and Dental Measurements of Icticyon venaticus.*

	I.	II.
Total length .....	118	
Length of palate .....	56	59
Breadth „ .....	40	41
Length of basicranial axis ..	52	
„ $\frac{pm.4}{pm.4}$ .....	11.5	13

	I.	II.
Length of $\frac{m. 1}{m. 1}$ .....	7	8
Breadth „ .....	7	8
Length of $\frac{m. 2}{m. 2}$ .....	3	
Breadth „ .....	3	
Length of $\frac{m. 1}{m. 1}$ .....	13	14.5
„ $\frac{m. 2}{m. 2}$ .....	4	5

In the British-Museum specimen (No. II.)  $\frac{m. 2}{m. 2}$  is absent, and there is no trace of any alveolus for it.

In absolute length, the skull No. I. (fig. 15, p. 268) comes very near *C. cancrivorus* (Table XIII. No. VI.), but differs from this in the relative length of the basicranial axis and shortness of the palate. It is a peculiarity of *Icticyon* which I have not observed in any other canine animal, that the upper and lateral margins of the occipital foramen are produced in such a manner as to give rise to a tubular prolongation which projects considerably beyond the occipital spine (fig. 15). Hence the total length given in Table XIV. is measured from the upper edge of this prolongation to the præmaxillary symphysis. The nasal bones are short and broad, and do not extend quite so far back as the fronto-maxillary suture. The glabellar region is evenly arched from side to side; and the postorbital processes are but slightly prominent; Burmeister's figure, however, shows that these become larger with age. The frontal sinuses are but slightly developed backwards; and this, judging by the marked constriction behind the postorbital processes in older skulls, appears to be the case even in old specimens.

The skull figured presents a narrow sagittal area, and the sagittal crest is undeveloped; but this feature also depends on the youth of the animal. In the large size of the paroccipital and mastoid processes, *Icticyon* resembles the larger Thooids of the Old World rather than its North-American congeners. The characters of the base of the skull are completely canine. The palate is wider in front than in *C. cancrivorus*. Posteriorly it is somewhat more prolonged and narrowed towards the nasal passage than usual; but a good deal of the peculiarity of appearance of this part of the skull of *Icticyon* arises from the small size of the hindermost molars.

The tympanic bullæ are not evenly arched as is usual in the smaller Thooids; but the outer is separated from the inner moiety of the convex surface by a well-defined oblique ridge. The rami of the mandibles are ankylosed together throughout the long symphysis, which measures 27 millims. This ankylosis has also taken place in the second specimen; and I am not aware that it occurs in any other of the Canidæ. The angle of the mandible is thick, short, and not produced inwards. Its lower edge is straight, and passes so abruptly into the convexity which follows, that the jaw presents, as it were, the next remove from the lobate condition beyond that of *C. fulvipes* (fig. 9, C, p. 252).





The upper incisors have the ordinary canine characters; and the large outer incisor is close to the second. The canines are very strong; and the first three præmolars are thick. Although the fourth præmolar has a length of only 11.5 millims., it is 7 millims. thick in front. The inner cusp, however, is very small. In both specimens a small but distinct cusp is developed from the anterior margin of the anterior blade-like cusp of this tooth. This is an unusual feature in the upper sectorial tooth of canine animals; and I am the more careful to draw attention to its existence, as, while Lund had mentioned the fact, Burmeister expressly denies it:—"Der Fleischzahn des Oberkiefers ist ganz Hundartig, d. h. der innere Nebenhöcker sehr klein; und die äussere Höckerreihe ohne den dritten vordern Höcker, welcher den Viverrinen zusteht" (*l. c.* p. 9). It is to be presumed therefore that this minute cusp was absent in Burmeister's specimen<sup>1</sup>.

The crown of the first upper molar is triangular and comparatively narrow, in consequence of the reduction of the cingulum and the disappearance of the posterior inner cusp. The crown of the minute second molar is nearly circular, with a median depression separating rudimentary outer and inner cusps (fig. 16, A). The lower sectorial presents peculiarities already noted by previous observers. Thus, the inner anterior cusp has altogether disappeared, the heel is very short, and the inner posterior cusp has also vanished. The second lower molar is very like the upper, its crown presenting a median depression bounded outside and inside by minute cusps, of which the inner is the lower (fig. 16, B, p. 269).

Thus the dentition of *Icticyon* is far more different from that of the ordinary Canidæ than that of any other known canine animal, whether recent or extinct, except *Otocyon*, standing in some respects at the opposite pole to the latter.

In all other points, *Icticyon* is not only, as Lund proved, unmistakably a member of the canine group, but it is so closely allied to the other North-American Thooids, that I can only regard it as a modification of the *Canis cancrivorus* type, analogous to that which, among the Old-World Jackals, has given rise to *Cyon*, but carried a step further.

In North America the Thooid division is represented only by such macrodont forms as *C. latrans* and *C. lupus (occidentalis)*.

The foregoing Table (XV.) gives the measurements of seven crania of *Canis latrans* in the British Museum and in the Museum of the Royal College of Surgeons. The exact locality of No. i. is unknown; No. ii. is from Hudson's Bay; No. iii. from Grand Isle, Platte Rock; No. iv. from Medicine Creek, Nebraska; No. v. from Fort Colville; No. vi. from Fort Kearney; and No. vii. from Columbia River. They therefore cover almost the whole extent of North America in longitude, and, as might be expected, exhibit a

<sup>1</sup> Similar but better-developed anterior basal cusps occur in the upper sectorial of *Otocyon*, and occasionally in other Canidæ, as *C. anthus*, *C. xerda*, and *C. bengalensis*. Hence no great taxonomic importance can be assigned to this character.

considerable range of variation, though probably less than a larger series would show<sup>1</sup>. But, as they are, I must confess myself unable to find any important break in the series of gradations of cranial and dental structure between *Canis latrans* and *C. antarcticus*, on the one hand (see Table XIII.), and *C. latrans* and *C. occidentalis* (Table XV., VIII., IX., X.) on the other. Moreover, considering that only two sets of measurements of *C. magellanicus* are given, it is not unreasonable to expect that, with a larger series of this form, all the American Thoooids, so far as their dental and cranial characters are concerned, would be susceptible of arrangement in a continuous series of almost imperceptible modifications. I may further remark that I can discern no difference of the slightest importance between skulls of *C. latrans* and those of some of our domestic Dogs<sup>2</sup>.

Of the three skulls of *Canis occidentalis* (Table XV. Nos. VIII., IX., X.), No. X. is a very large typical Wolf-skull, nowise distinguishable from the most characteristic examples of the Old-World Wolves. Nos. VII. and VIII., on the other hand, have teeth not at all, or but little, larger than those of some specimens of *C. latrans*, from which they differ chiefly in the greater width of the palate and total length of the skull. Moreover, in these skulls the facial line, instead of being nearly straight or even slightly convex, as is usual in Wolves, Jackals, and domestic Dogs of the Greyhound type, is as concave as in the skulls of many Newfoundland Dogs and Mastiffs, to which they present striking resemblances.

If we now leave the New-World for the Old, travelling westward, it is a very interesting fact that in Japan, in the Amur basin, and in North China we meet with a form of canine animal which has been made the type of a distinct genus, *Nyctereutes*, but which is essentially a low Thoooid of the South-American type. This is the *Canis procyonoides*<sup>3</sup>, of the external characters, the skeleton, and dentition of which a full account has been given by Schrenck ('Reisen und Forschungen im Amurlande,' Band i. 1858).

TABLE XVI.—*Cranial and Dental Measurements of Canis procyonoides.*

	I.	II.	III.	IV.
Total length .....	115	107	96	...
Length of palate .....	57	55	49	54
Breadth „ .....	34	33.5	38	34

<sup>1</sup> Baird's observations ('Report,' under *Canis*) point to an extraordinary amount of local variation in *C. occidentalis* and *C. latrans*.

<sup>2</sup> The close resemblance of *C. latrans* to certain domestic Dogs of the Old World has already been noted by Jettles and Coues. See the former writer's excellent essay 'Die Stammväter unserer Hunde-Rassen,' 1877.

<sup>3</sup> The specific name appears to me to be as little applicable as the generic distinction of "*Nyctereutes*" is justifiable. Beyond a superficial external resemblance, there is nothing of the Raccoon about this animal.

	I.	II.	III.	IV.
Length of basicranial axis .....	39	...	39	41
„ $\frac{pm. 4}{m. 1}$ .....	9.7	10	10	11
„ $\frac{m. 1}{m. 2}$ .....	8	8	8.5	9
Breadth „ .....	8.2	8.6	...	9
Length of $\frac{m. 2}{m. 1}$ .....	5	5	5	5
Breadth „ .....	6	6	...	6
Length of $\frac{m. 1}{m. 2}$ .....	11	12	12	12
„ $\frac{m. 2}{m. 3}$ .....	6	6	6	6.5
„ $\frac{m. 3}{m. 4}$ .....	3	...	...	3

This is made manifest by the comparison of the measurements of the skulls I., II., III., IV. in the preceding Table (of which No. II. is from "North China," while the rest are Japanese) with those of *Canis azaræ* (a) given in Table XIII.

Nos. I. and II. are adult skulls having a narrow lyrate sagittal area, and curiously similar to *Otocyon* in the elongation of the jaws and the marked lobation of the mandible. The outer incisor above is separated from the others by a distinct interval; and the bony palate extends for 2-5 millims. behind the level of the hindermost molars. No. III. is young, the permanent teeth not having completely emerged.

The Japanese *C. hodophylax*, of which there is a fine specimen now living in the Gardens, appears to be simply a small form of Wolf; but in the absence of any accessible skulls of this form or of *C. nippon*, I refrain from giving any definite opinion about them. All the Asiatic *Thoooids*, north of the Altai, appear to be mere varieties of *C. lupus*. But in the Altai range itself, in the upper basins of the Jenessei and the Lena, and as far eastward as the shores of the Sea of Ochotsk the *Canis alpinus* makes its appearance (Schrenck, *l. c.* pp. 48-50).

This species, *C. primævus*, *C. dukhunensis*, and *C. sumatrensis* have been separated as a distinct genus, *Cyon* (*Cuon*, Hodgson), on account of the constant absence of  $\frac{m. 3}{m. 4}$ . They agree, not only in this respect<sup>1</sup>, but in the breadth of the jaws and, very generally, in a marked convexity of the facial line. In this respect they depart from the ordinary Wolves and Jackals in the opposite direction to some Wolves and to the majority of the domestic Dogs, in which this contour tends to become strongly concave.

The following Table of the measurements of nine skulls shows the close affinity of the forms associated under *Cyon* :—

<sup>1</sup> Van der Hoeven (*l. c.*) mentions that he found  $\frac{m. 3}{m. 4}$  present in one specimen of *C. rutilans* out of six examined,

TABLE XVII.—Cranial and Dental Measurements of Cyon.

	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.
Total length.....	163	...	167	164	184	177	...	174	183
Length of palate .....	77	82	77	82	85	85	98	85	90
Breadth " .....	55	57	59	60	61	61	68	65	65
Length of basiscranial axis .....	...	...	60	60	68	67	69	65	61
" $\frac{pm.4}{m.1}$ .....	19	19	19	20	20.5	20.5	20.5	22	21.2
" $\frac{m.1}{m.1}$ .....	12.5	12	13	12	13	13	13	13.5	15
Breadth " .....	12.5	12	14	13	13.5	13.5	14.5	14	15
Length of $\frac{m.2}{m.1}$ .....	6	4.5	5.3	...	5.5	5	5	5	7
Breadth " .....	8.5	5	8	...	7.5	8	8	7.3	10
Length of $\frac{m.1}{m.1}$ .....	20	20	21	21	21	21.5	21.5	22.5	23
" $\frac{m.2}{m.2}$ .....	7.5	7	8	8	7	7	9	8	9

[*C. stenderensis*, No. I., is from Sumatra; No. II. from Malacca; *C. priemus*, Nos. III. and V., from Sikkim; *C. dubluensis*, No. IV., from Central India; No. VI. from Cashmere; No. VII. from Outack; No. VIII. from Nepal; *C. alpinus*, No. IX., from the Altai.]

In none of these skulls was a trace either of the hindermost lower molar or of its alveolus to be seen. Jerdon states that *C. primævus* "is common in Ceylon, where it is called the Dhole by some, by which name it has been treated of by Hamilton Smith and other writers; and it is found all over the jungles of Assam, Burmah, and the Malayan peninsula," which is in contradiction to the commonly received opinion that there are no wild dogs in Assam and Burmah. According to S. Müller, the same species is found in Borneo.

The distribution of this group over an area which covers nearly 60 degrees of latitude and about as much of longitude in Eastern and Southern Asia is very remarkable, when taken in conjunction with the fact that the proper Jackals, although coexistent with *Cyon* in Hindostan, are absent over the rest of the *Cyon* area, except perhaps in Burmah; while, to the westward of Hindostan, *Cyon*, so far as is known, is absent in the vast area inhabited by the Jackals. For the species united under *Cyon* appear to me to be nothing but large and slightly modified forms of the Jackal type, which thus seems to have become somewhat specialized at the eastern extremity of its area of distribution.

I have already referred to the variability of *Canis aureus*; and the amount of variation exhibited by that species will become still more apparent by an inspection of the following Table of measurements of the skulls of thirteen specimens of *Canis aureus* from India. From this it appears that the skull of this species may vary in absolute length 28 per cent., in the length of the palate by nearly 30 per cent., in its width by more than 25 per cent., in the length of the basicranial axis by about 20 per cent., in the length of  $\frac{pm.4}{m.1}$  rather more than 25 per cent., in the length of  $\frac{m.1}{m.1}$  about 11 per cent.

If the measurements of *C. anthus*, *C. lateralis*, *C. simensis*, and *C. mesomelas*, given in the same table, are compared with those of *C. aureus*, it is obvious that the great majority fall into place somewhere in the series of *C. aureus*; and the only notable difference is in *C. simensis*, in which there is a remarkable elongation of the palate. But this is exactly that part of the skull which varies most in *C. aureus*; and the difference in length between the longest and shortest palate in this species, 19 millims., is exactly the same as that between the longest palate of *C. aureus* and that of *C. simensis*. I do not doubt that a larger number of specimens of *C. anthus* and of *C. simensis* would afford a complete series of intermediate forms between them and the Common Jackals.

Just as, at the eastern extremity of the Jackal area, the large *Cyon*-form with specially modified dentition is met with, so at its western extremity, in South Africa, the large *Lycaon*-form, with specially modified fore feet, occurs. In the breadth of the præmolar region of the upper jaw, and in a more or less marked convexity of the facial contour, *Lycaon* strongly reminds one of *Cyon*; but the dentition is complete, stronger, and more wolf-like, and the edges of the hinder præmolars are more deeply lobed.

TABLE XVIII.—Cranial and Dental Measurements of Jackals.

	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.	XIII.	XIV.	XV.	XVI.	XVII.	XVIII.	XIX.
Total length .....	136	154	140	145	159	150	165	147	157	150	175	168	168	150	165	...	203	155	155
Length of palate .....	66	76	72	70	75	71	78	70	77	74	85	84	83	76	81	87	104	82	79
Breadth .....	45	51	48	47	51	50	54	50	52	54	57	54	53	53	53	54	53	45	48
Length of basiscranial axis...	51	55	...	52	...	55	...	49	56	59	...	56	59	53	53	...	65	54	51
" " " " " " " " " "	15	15	15.5	15.5	16	16	17	17	17	17	17	18	19	17	18	17	16.5	14.5	19
" " " " " " " " " "	12	...	13	11	11.5	12	13	12	12	13	14	13	12	12	12	13	13	11	12
Breadth .....	12	...	13	12.5	13	12	14.5	13.5	12	14	15	13	14	14	15	15	13	12.5	14.5
Length of $m_2$ .....	6	...	6	6	7	6	7	6	5	7	7	7	7	7	6.5	7.5	8.5	7	7.5
Breadth .....	8	...	9	9	10.5	9	9	9.5	7	10	11	9	10	10	11	12	10	9	10
Length of $m_1$ .....	19	19	19	18	18	19	20	19	19.5	18	21	19	20	19	19	20	19.5	17	20
" " " "	8	8	8	8	9	8.5	9	8	8	10	9.5	9	9	9	8.5	10	10.5	9	9
" " " "	4	4	4	3.5	4.3	4	4	4	5.5	...	4	4	4	...	...	5	4.2	5	5

[Nos. I. to XIII., *C. aureus*, from India; Nos. XIV. to XVI., *C. anthus*, from North Africa; No. XVII., *C. sinensis*, from Abyssinia; No. XVIII., *C. lateralis*, from the Gaboon; No. XIX., *C. mesomelas*, from South Africa.]

TABLE XIX.—*Cranial and Dental Measurements of Lycaon.*

	I.	II.	III.	IV.	V.
Total length .....	185	194	203	...	250
Length of palate .....	88	91	100	98	100
Breadth „ .....	76	73	69	71	74
Length of basiscranial axis ...	63	69	68	71	69
„ $\frac{pm. 4}{m. 1}$ .....	20	20	20	20.5	21
„ $\frac{m. 1}{m. 2}$ .....	15	15	15	16.5	16
Breadth „ .....	15.5	15.5	16	...	16.5
Length of $\frac{m. 2}{m. 1}$ .....	7	6	7	7.5	7.5
Breadth „ .....	9	8	10.5	...	10
Length of $\frac{m. 1}{m. 2}$ .....	23.5	24	24.5	25	25
„ $\frac{m. 2}{m. 3}$ .....	9.5	10	9	9	11
„ $\frac{m. 3}{m. 4}$ .....	...	4	4.5	4.2	5

The Indian Wolf, *Lupus pallipes*, more nearly approaches the Jackals than any other Old-World Wolf I have seen. But only two skulls of this species have as yet come into my hands; and though they differ considerably, the chances are greatly against their representing the extremes of variation of the species. When the Canidæ of Turkestan are better known than at present, I have little doubt that the inconsiderable break between the Old-World Jackals and Wolves will be filled up.

It is obvious that the range of variation of the Eastern is as great as that of the Western Wolves (Table XX.); and I conceive that *C. pallipes*, *C. chanco*, and *C. laniger* must be regarded as mere local varieties of *C. lupus*, inasmuch as the table shows that the European Wolf (Nos. II., V., VII., VIII.) includes within its range of variation all the cranial differences presented by these so-called species.

13. The palæontological history of the Canidæ is, at present, very imperfect; but sufficient has been ascertained to enable us to obtain a general conception of the phylogeny of the group.

There is no question that Thoooids and Alopecoids similar to those which exist at present inhabited Europe during the Quaternary epoch. Remains of the Dingo have been found in Australian deposits of apparently the same age; and the explorations of Lund in the Brazilian caves have demonstrated the existence of several forms of Canidæ of the existing South-American types—among the rest, of *Icticyon*, with which I conceive Lund's *Speothos* must be merged.

The *Palæocyon* of Lund, a large wolf-like animal with forty-two teeth, but with the second upper molar very small and with the

TABLE XX.—Cranial and Dental Measurements of Wolves of the Old World.

	I.	II.	III.	IV.	V.	VI.	VII.	VIII.
Total length.....	215	223	234	236	240	240	250	257
Length of palate.....	109	102	110	111	109	119	111	116
Breadth .....	72	71	72	70	73	77	82	79
Length of basiscranial axis .....	71	63	74	...	71	77	78	75
" $\frac{pm.4}{m.1}$ .....	21.5	22	23.5	24	24	25	28	29
" $\frac{m.1}{m.2}$ .....	15	15.5	16	16	16.5	16	17	17
Breadth .....	16.5	17	16.5	18	19.5	17	20	20
Length of $\frac{m.2}{m.1}$ .....	8	8.5	8	8	9	8	9	9
Breadth .....	10.5	13	10.5	12	13	11	13.5	13
Length of $\frac{m.1}{m.2}$ .....	24.5	26.5	25.5	28.5	28	28.5	30	30
" $\frac{m.2}{m.3}$ .....	10	10.5	11.5	12	12	11	12	12.5
" $\frac{m.3}{m.4}$ .....	...	5.5	5.5	...	6	4	5	5.5

[No. I., *C. pallipes*, from India; No. II., *C. lupus*, from Belgium; No. III., *C. pallipes*, from India; No. IV., *C. chama*, from Tibet; No. V., *C. lupus*, from Russia; No. VI., *C. lanius*, from Tibet; Nos. VII. and VIII., *C. lupus*, European, but the locality not certainly known.]



inner cusp of both the upper and the lower sectorials (which measure not less than 28 millims. in length) obsolete, has no representative in the existing fauna. This fact is the more interesting, as the dentition of *Palæocyon*, in some respects, presents a more thoroughly carnivorous aspect than that of the Old-World Wolves.

Information respecting the Pliocene Canidæ is scanty. One of the best-known forms is the *Canis borbonicus* (*C. meganastoides* of Pomel), briefly described and figured by Gervais in the 'Paléontologie Française' (ed. 2, p. 213, pl. xxvii. fig. 7). An almost entire skeleton was obtained from the Pliocene of Cerdé near Issoire. The skull is 150 millims. long; and Gervais justly observes that the ramus of the mandible resembles that of *C. cancrivorus*. From the figure I judge that the teeth were no less similar to those of this species. The humerus has an intercondyloid but no supracondyloid perforation; and the digits are five in front and four behind.

Opinions differ as to whether the deposits of Eningen should be reckoned Lower Pliocene or Upper Miocene. The skull of the famous fossil Fox of Eningen, originally described by Mantell, and subsequently made the type of a new genus, *Galecynus*, by Professor Owen, is unfortunately not in a sufficiently good state of preservation for the determination of the question whether it belongs to the Alopecoid or to the Thooïd series. In its cranial and dental measurements it agrees with surprising closeness with the common Fox; and this correspondence extends even to the form and dimensions of the left upper sectorial tooth, which I have recently found could be readily exposed for about half its length in the specimen preserved in the Geological Society's Museum. There is, however, a rather stronger indication of a secondary cusp on the anterior part of the base of the blade of this tooth than is usual in the Foxes. At present I fail to see any sufficient ground for placing this animal in a distinct genus from the Foxes. Considering the known amount of variation in the pollex of different Canidæ, its slightly greater proportional length in the Eningen skeleton, though an interesting fact in itself, can hardly be regarded as of much systematic importance.

Much light has recently been thrown upon the palæontological history of the Canidæ by M. Filhol's<sup>1</sup> important researches upon the fossils of the phosphoritic deposits of Upper Eocene age in France, and especially upon the abundant remains of the genus *Cynodictis*. Of these "viverrine Dogs," as M. Filhol calls them, he distinguishes no fewer than seventeen varieties, which shade off, on the one hand, into true Viverridæ, and, on the other hand, into the Amphicyonidæ.

M. Filhol has so fully described and so well figured examples of a large suite of specimens of the different forms of *Cynodictis*, that it is possible for those who have not enjoyed the opportunity of examining his materials to form an independent judgment as to the conclusions which may be drawn from them; and on one or two points I venture to dissent from his views.

<sup>1</sup> "Recherches sur les phosphorites de Quercy," Bibliothèque de l'École des Hautes Études, xv. & xvi. 1876, 1877.

Thus, in treating of *Canis filholi*, M. Filhol observes:—

“Je ne crois pas que ce soit là un *Canis* vrai, car le tubercule interne de la carnassière est beaucoup trop développé; il est fort élevé et se réunit par son bord antérieur au bord postérieur de la pointe antérieure; la portion moyenne de la face interne de la pointe principale n'est pas visible en dedans comme sur les Chiens vrais, elle est marquée à sa base par l'union des deux autres pointes”<sup>1</sup>. . . . . “Je serais assez porté à penser que le *Canis filholi* doit rentrer dans le groupe du *Cynodictis cayluxi*, auquel le rattache la forme de la carnassière du *Cynodictis intermedius*. Il indique certainement une tendance des *Cynodictis* à prendre les caractères des Canidés, mais l'ensemble de ses caractères est trop viverrien encore pour qu'on puisse le placer parmi les *Canis*. La même observation doit être faite pour le *Cynodictis crassidens*. Ces types sont excessivement intéressants, car ils paraissent peut-être indiquer par la dégradation successive des caractères de la carnassière l'origine ancienne de nos Chiens.”

But the characters of the tooth to which M. Filhol refers cannot be regarded as sufficient to differentiate *Cynodictis* from the true *Canidæ*, when we have in *Otocyon* (fig. 13, C, p, 260) a lower sectorial which may be described in the same terms. In fact, apart from the number of the teeth, the dentition of *Otocyon* departs more widely from that of the more differentiated *Canidæ* than that of *Cynodictis* does, the teeth of the latter taking a place alongside of those of the lower Thoooids and Alopecoids.

After describing the skull of *Cynodictis boriei*, M. Filhol remarks:—“Il n'y a rien dans le groupement des diverses parties dont j'ai successivement indiqué la position qui permette une comparaison avec les différents groupes de nos Carnivores. La base du crâne des Ursidés, des Canidés, des Viverridés, des Felidés, des Hyænidés, des Mustélidés, est tout-à-fait différente; celle des Marsupiaux l'est également” (*l. c. t. xv. p. 74*).

Without inspection of the specimens on which M. Filhol bases this opinion, it is hazardous to traverse it; but I confess his detailed description and excellent figures lead me to form a different conclusion, and to think that, in cranial characters, *Cynodictis* nearly approaches the South-American Thoooids; and especially *Icticyon*, in the proportions of the face and skull.

In the actual measurements of the palate and of the teeth, *Cynodictis* comes extraordinarily near to certain living South-American forms. Thus, *C. leptorhynchus* is very like *C. vetulus*, while *Cynodictis gryei* almost as closely approaches *C. azaræ*—the chief difference, in the latter case, being the less transverse diameter of the sectorial and of the two molars of the upper jaw in *C. azaræ*.

<sup>1</sup> *Loc. cit.* tome xvi. p. 319.

TABLE XXI.—*Cranial and Dental Measurements of Cynodictis and Canis.*

	I.	II.	III.	IV.	V.
Length of palate .....	42	48	79	72	...
Breadth „ .....	29	29	39	41	...
Length of $\frac{pm. 4}{}$ .....	8	7	13	12.5	14
Breadth „ .....	5	5.5	9	6	10
Length of $\frac{m. 1}{}$ .....	6	7	...	9.3	11
Breadth „ .....	7.5	8	...	11	15
Length of $\frac{m. 2}{}$ .....	4	5	6.5	6	8
Breadth „ .....	6.5	6.5	9	7	9.5
Length of $\frac{m. 1}{}$ .....	7	9.5	...	14.5	13.5
„ $\frac{m. 2}{}$ .....	4	6.5	...	7.5	...
„ $\frac{m. 3}{}$ .....	3	3	...	4	...

[No. I. *Cynodictis leptorhynchus*; No. II. *Canis vetulus*; No. III. *Cynodictis gryei*; No. IV. *Canis azaræ*; No. V. *Cynodictis boriei*. The measurements are partly given by M. Filhol and partly taken from his figures.]

The skull of *Cynodictis boriei* is as large as that of an ordinary European Wolf, so that the microdont character is very striking, while the great thickness of the upper sectorial and the large size of the upper molar brings this form still nearer to *C. vetulus* than to *C. azaræ*.

Taking all the facts of the case into consideration, I am disposed not only to agree with the conclusion to which M. Filhol's remarks tend, that *Cynodictis* lies in the direct line of ancestry of the Canidæ, but to suppose that, in skull and teeth, it represents pretty closely the stock from which the branch of the Viverridæ has diverged, subsequently to give rise to the Felidæ and Hyænidæ.

On the other hand, as M. Filhol points out, certain forms of *Cynodictis* closely approach *Amphicyon*, a genus in which  $\frac{m. 3}{}$ , usually aborted in all the existing Thoid and Alopecoid Canidæ, is present, though much smaller than  $\frac{m. 2}{}$  and evidently in course of suppression. In other respects, as in the shortness of  $\frac{pm. 4}{}$  relatively to  $\frac{m. 1}{}$ , the large size of  $\frac{m. 2}{}$  relatively to  $\frac{m. 1}{}$ , and of  $\frac{m. 2}{}$  relatively to  $\frac{m. 1}{}$ , the dentition of *Amphicyon* repeats the general characters of that of *Cynodictis*.

None of the varieties of *Cynodictis* or of *Amphicyon* exhibits a distinctly lobate form of mandible; nor, so far as I am aware, has any specimen of the latter genus been discovered with more than three molars above and below. Hence, if I am right in supposing that in the dentition of *Otocyon* we have a representation of the

number and the kinds of teeth which existed in the earliest ancestors of the Canidæ, and that the lobate mandible is similarly inherited from them, it becomes necessary to seek, for the primitive forms of the Carnivora which probably stood in the same relation to *Amphicyon* as *Otocyon* does to *Canis* and *Vulpes*, in still older formations. Nothing is at present known of the Mammals of the Cretaceous epoch; and from the older Eocene the only forms which bear upon the present question are *Arctocyon*, *Pterodon*, and *Hyænodon*. Of the first too little is known to warrant speculation. With respect to the two latter, M. Filhol's observations have conclusively proved that they have as little to do with the Didelphia in dentition as in other respects; and he has described an interesting form, *Cynhyænodon*, the upper dentition of which approaches that of *Pterodon*, while its mandibular teeth present resemblances to those of *Cynodictis*.

I do not suppose, however, that *Pterodon* (and still less *Hyænodon*) lies in the direct line of ancestry of the Canidæ. On the contrary, they appear to constitute a peculiar branch of the stock of the Carnivora, having closer relations to the Insectivora than are possessed by modern Carnivores.

In fact, in *Centetes*, the molar teeth of both jaws increase in size from before backwards, and the patterns of their crowns are such that those of all the Carnivora may be readily derived from them. The trihedral prism which constitutes the chief part of the first upper molar of *Centetes* obviously answers to the triangular elevation on the crown of the corresponding tooth of *Otocyon*, which terminates in the two outer and the two inner cusps; and the main difference between the two is that the cingulum is larger and extends much nearer to the summits of the cusps in *Otocyon* than in *Centetes*.

In the mandibular teeth, again, the first molar of *Centetes* presents exactly the same number of cusps, disposed in the same way as in that of *Otocyon*, the difference between the two lying merely in the different proportions of the parts. The exact correspondence in plan of these teeth is the more interesting, since, in *Centetes*, it is easy to trace the progressive changes by which the simple and primitive character of the Mammalian cheek-tooth exhibited by the most anterior præmolar passes into the complex structure of the crowns of the posterior teeth.

This is particularly obvious in the lower cheek-teeth, in which the crown of the most anterior præmolar is simply tricuspidate, with the anterior and the posterior cusps very small and the apex of the principal cusp simple. In the next præmolar the principal cusp appears cleft near its apex, in consequence of the development of a small secondary cusp on its inner side; the anterior cusp is higher and the posterior both higher and thicker. In the third præmolar, and in the molars, the anterior cusp is still higher; the secondary cusp is as large as that from which it is derived, so that it answers to the anterior internal cusp, while the former principal cusp takes the place of the anterior external cusp of the typical canine tooth. The posterior cusp, become very broad, and divided by a faint median depression, represents the posterior external and posterior internal

cusps of the lower sectorial of the Dogs. A series of changes of just the same kind is observable in *Gymnura*; but the posterior cusps acquire a much greater size, and the molars take on a procynoïd character.

If the cheek-teeth of *Centetes*, *Gymnura*, *Otocyon*, and *Nasua* are placed side by side, it is easy to see that the first presents the least-modified condition of the pattern of the crowns of the molars common to the whole series. The reduction, or the less development, of the addition to the inner sides of the teeth, on the other hand, would give such crowns as those of *Pterodon* and *Hyænodon*.

The Insectivorous affinities of the dentition of the lower Carnivores harmonize very well with other peculiarities of the group.

The presence of a rudimentary clavicle and of a rudimentary hallux in the existing Canidæ leaves no reasonable doubt that they are descended from ancestors which possessed both in a complete state. And the suggestion is no less obvious that their digitigrade condition has resulted from the modification of a plantigrade form. Now we do not know whether any of the Eocene Canidæ possessed clavicles; but there is reason to believe that *Amphicyon* was plantigrade and pentadactyle.

M. Filhol has shown that *Cynhyænodon* had a brain more like that of an Insectivore than that of a Carnivore; and this fact is in accordance with a rule which now rests on a pretty broad basis of induction, that, in any given series of Mammals which is represented throughout the Tertiary series, the oldest forms had less highly developed brains than their modern representatives.

But, if the oldest Tertiary Carnivores were pentadactyle, plantigrade, clavicate, and had brains with relatively small cerebral hemispheres and large, completely exposed, cerebella, one may ask, by what characters were they distinguishable from the Insectivora? and why may not *Hyænodon* and *Pterodon* be an extreme development of that type of the Insectivora which is at present represented by *Centetes*?

On the other hand, if the primitive stock of the terrestrial Carnivora was represented by a plantigrade, pentadactyle, clavicate form with the dentition and jaw-angle of *Otocyon* and provided with epipubes, we should be furnished with that which is at present wanting, namely a link between the monodelphous and the didelphous Mammalia. According to our present system of classification, such a mammal would be grouped among the Insectivora, or as a transitional form between them and the *Didelphia*; and I have long entertained the conviction that the primary stock of all the groups of the monodelphous Mammalia will be found to occupy this position.

14. It may be desirable to state in a summary form the principal conclusions to which the facts stated in the preceding pages appear to me to point.

I. The existing Canidæ exhibit a gradual series of modifications, in the form and size of their skulls and the number and characters of their teeth, from *Otocyon*, as the least-differentiated member of the

group, to the Wolves, Lycaons, Cyons, and Northern Foxes, as the most modified forms.

II. In the skull these modifications consist chiefly (*a*) in the increase of absolute size; (*b*) in the increase of the relative dimensions of the jaws, and particularly in the width of the palate; (*c*) in the persistence or disappearance of the sagittal area common to all young Canidæ, and the correlative development or absence of a sagittal crest; (*d*) in the diminution of the inflexion of the angular process of the mandible; (*e*) in the disappearance of the subangular lobe.

III. In the teeth, the most important modifications are the increase in the proportional size of the sectorials, accompanied by the relative diminution and, in some cases, suppression of the posterior molars. In *Otocyon*,  $\frac{m.4}{m.4}$  has usually disappeared. In *C. cancrivorus*,  $\frac{m.4}{m.4}$ ,  $\frac{m.3}{m.3}$ , and  $\frac{m.2}{m.2}$  are most frequently suppressed; but  $\frac{m.4}{m.4}$  often remains, and  $\frac{m.3}{m.3}$  persists in one known case. In the great majority of the Canidæ,  $\frac{m.4}{m.4}$ ,  $\frac{m.3}{m.3}$ , and  $\frac{m.2}{m.2}$  are normally suppressed, while  $\frac{m.3}{m.3}$  becomes relatively small, and, as a rule, disappears in *Cyon*. Finally, in the majority of examples of *Icticyon*, both  $\frac{m.2}{m.2}$  and  $\frac{m.3}{m.3}$  are wanting, and when  $\frac{m.2}{m.2}$  is present it is very small.

The gradation will be rendered more intelligible by placing the formulæ of the cheek-teeth under one another.

	Maxilla.				Mandible.			
	<i>pm.</i>		<i>m.</i>		<i>pm.</i>		<i>m.</i>	
<i>Otocyon</i> :								
Fullest dentition observed...	1	2	3	4	1	2	3	4
Ordinary .....	1	2	3	4	1	2	3	*
	1	2	3	4	1	2	3	4
<i>C. cancrivorus</i> :								
Fullest dentition observed...	1	2	3	4	1	2	3	*
Ordinary .....	1	2	3	4	1	2	*	*
	1	2	3	4	1	2	3	4
Most Alopecoids and Thoooids	1	2	3	4	1	2	*	*
	1	2	3	4	1	2	3	4
<i>Cyon</i> .....	1	2	3	4	1	2	*	*
	1	2	3	4	1	2	3	4
<i>Icticyon</i> :								
Fullest dentition observed...	1	2	3	4	1	2	*	*
Ordinary .....	1	2	3	4	1	*	*	*
	1	2	3	4	1	2	3	4

In the individual teeth, the most important changes are the increase of the length in proportion to the breadth of the upper sectorial, and, in the lower sectorial, the change in the relative dimensions and position of the inner anterior cusp, which, from being on a level with the outer and higher than it in *Otocyon*, becomes smaller and shifts further and further backwards, eventually even disappearing, as in

*Icticyon* and *Palæocyon*. The heel of this tooth also diminishes in proportion to its blade.

IV. All the known kinds of canine animals may be arranged in two series, starting from *Otocyon* as the nearest ally of the lowest member of each series.

It is probable that when a sufficient number of specimens of each species at present recognized has been examined, it will be found that the forms with least-modified skulls and teeth are connected by insensible gradations with those with most-modified skulls and teeth, and that no absolute line of demarcation can be drawn between one species and another in cranial and dental characters.

There is no evidence that any one of these species is infertile when crossed with any other. Such evidence as exists with respect to *C. cancrivorus*, the Jackal, Dog, and Wolf tends to the conclusion that species of approximately the same size are capable of fertile unions.

V. The taxonomy of the Canidæ, under these circumstances, is very much a matter of convention. I am disposed to think that the most convenient mode of representing the facts is to regard *Otocyon* and the Thoid and Alopecoid series respectively as genera, retaining for the two latter the old names of *Canis* and *Vulpes*.

In each of these genera a lower, a middle, and a higher section may be conveniently recognized, though they are hardly susceptible of strict definition.

Thus, in the genus *Vulpes*, Baird has separated *V. littoralis* and *V. cinereo-argentatus* under the name of *Urocyon*. The Corsacine Foxes, *V. zerda*, *V. caama*, *V. bengalensis*, and *V. velox* may constitute another subgeneric section, and the most differentiated Foxes, such as *V. lagopus*, *V. fulvus*, and the rest, a third.

In the genus *Canis* we have, in like manner, as a lowest section the species of the *C. cancrivorus* and *C. vetulus* type (answering pretty much to the Aguarrá Dogs of Hamilton Smith), the Sacaline section (*C. aureus*, *C. anthus*, *C. mesomelas*, *C. antarcticus*, *C. latrans*), and the Lupine section (*C. lupus* and all its varieties). *Icticyon*, *Lycaon*, and *Cyon* may probably be usefully retained as subgeneric names for the special modifications of the Thoid type which are denoted by them.

As for species, no one zoologist has ever yet agreed with the estimate of another as to what should be considered species and what local varieties among Wolves and Foxes; and, as there is no criterion by which the question can be decided, it is probable that such agreement never will be attained. The suggestion that it may be as well to give up the attempt to define species, and to content oneself with recording the varieties of pelage and stature which accompany a definable type of skeletal and dental structure in the geographical district in which the latter is indigenous, may be regarded as revolutionary; but I am inclined to think that sooner or later we shall have to adopt it.

VI. The most notable facts in the Distribution of the Canidæ are:—  
(1) the occurrence of the Corsacine Alopecoids and the Sacaline

Thooids, side by side, from South Africa, through Central Asia, to India and North and South America; (2) the limitation of *Otocyon* to South Africa; (3) the limitation of Aguarine Thooids to South America and North-east Asia, including Japan; (4) the limitation of the most specialized Thboids, namely the Wolves and the ordinary Foxes, to the Northern hemisphere; (5) the exclusion of Foxes from South America; (6) the distribution of *Oyon*, which curiously resembles that of the Tiger.

If provinces of distribution were marked out by the Canidæ, they would by no means correspond with those generally recognized. There is nothing peculiar about the Australian dog, while the American continent contains within itself all the chief types of Canine animals, except *Otocyon*. The presence of this form, with its ancient type of dentition, in South Africa is not improbably due to the fact that this region contains the remains of a very old Mammalian fauna.

VII. The morphological relations of the living Canidæ are such as to suggest that they result from the gradual accumulation of small variations in the general direction of increase of size and of differentiation of the teeth, superinduced upon a primitive stock which presented the full microdont dentition of *Otocyon*.

VIII. Though the palæontological history of the Canidæ is incomplete, the facts which are ascertained tend in the same direction. In skull and dentition, the older Tertiary Canidæ either, as in the case of *Cynodictis*, resemble the less-differentiated Canidæ, or, as in *Amphicyon*, present a third upper molar, such as occasionally exists in *Canis cancrivorus*. But if, as I suppose, *Cynodictis* and *Amphicyon* were preceded by forms having four molars above and below, they have yet to be discovered, as no Eocene mammals with four molars, except Opossums, have as yet been brought to light.

IX. The primitive stock of the dogs, for which we thus have to seek in older Eocene or earlier deposits, is theoretically required to have been a pentadactyle plantigrade animal provided with clavicles and possibly with bony epipubes. Such an animal, if it existed now, would probably be regarded as an Insectivore with more or less marked didelphous affinities.

In conclusion I desire to express my thanks to the President, to Dr. Günther, and to Dr. Rolleston for the ready access afforded me to the abundant materials for the study of the Canidæ in the Museum of the Royal College of Surgeons, the British Museum, and the Oxford Museum, to Sir Joseph Fayrer and to Mr. Wood-Mason, of the Indian Museum at Calcutta, for the great trouble they have been good enough to take in supplying me with specimens of Indian species, and to Professor Peters, of Berlin, for the loan of a skull of *V. corsac*.

[P.S. I ought to mention that large additions have been made to this paper since it was read before the Society; but I have deferred the consideration of the origin and relations of the domestic dogs until the evidence which I am at present collecting is more complete. July 4th, 1880.]



## LIST OF WOODCUTS.

- Fig. 1. Dorsal views of the skulls of *C. azaræ* and *C. vulpes*, p. 241.  
 2. Lateral views of the same, p. 242.  
 3. Cheek-teeth of the same, p. 243.  
 4. Longitudinal sections of the skulls of the same, p. 246.  
 5. Casts of the interior of the cranial cavities of the same, p. 247.  
 6. Cheek-teeth of *C. argentatus* and *C. littoralis*, p. 249.  
 7. Cheek-teeth of *C. lupus* and *C. azaræ*, p. 250.  
 8. Dorsal views of the skull of *C. azaræ* and *C. littoralis*, p. 251.  
 9. Left ramus of the mandible of *C. azaræ*, *C. littoralis*, and *C. fulvipes*, p. 252.  
 10. Dorsal view of the skull of *C. fulvipes*, p. 254.  
 11. Dorsal view of the skull of *Otocyon lalandii*, p. 257.  
 12. Lateral view of the same, p. 258.  
 13. Upper and lower cheek-teeth of *Otocyon lalandii*; lower sectorial teeth of the same, of *C. zerda*, and *C. lupus*, p. 260.  
 14. Mandibles of *Perameles*, *Procyon*, and *Otocyon*, viewed from behind, p. 263.  
 15. Side view of the skull of *Icticyon venaticus*, p. 268.  
 16. Cheek-teeth of the same, p. 269.

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April 20, 1880.

Professor W. H. Flower, LL.D., F.R.S., President, in the Chair.

The Secretary made the following report on the additions to the Society's Menagerie during March 1880 :—

The total number of registered additions to the Society's Menagerie during the month of March was 97, of which 10 were by birth, 30 by presentation, 34 by purchase, 16 received in exchange, and 7 received on deposit. The total number of departures during the same period, by death and removals, was 97.

The most noticeable addition during the month was :—

A pair of Spanish Ichneumons (*Herpestes widdringtoni*) from Andalusia, presented by J. C. Forster, Esq., F.Z.S., March 19.

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Prof. Owen, C.B., F.R.S., read descriptions of various new and little-known species of Cephalopoda, amongst which was a new generic form proposed to be called *Tritaxopus*.

This paper will be published in the Society's 'Transactions.'

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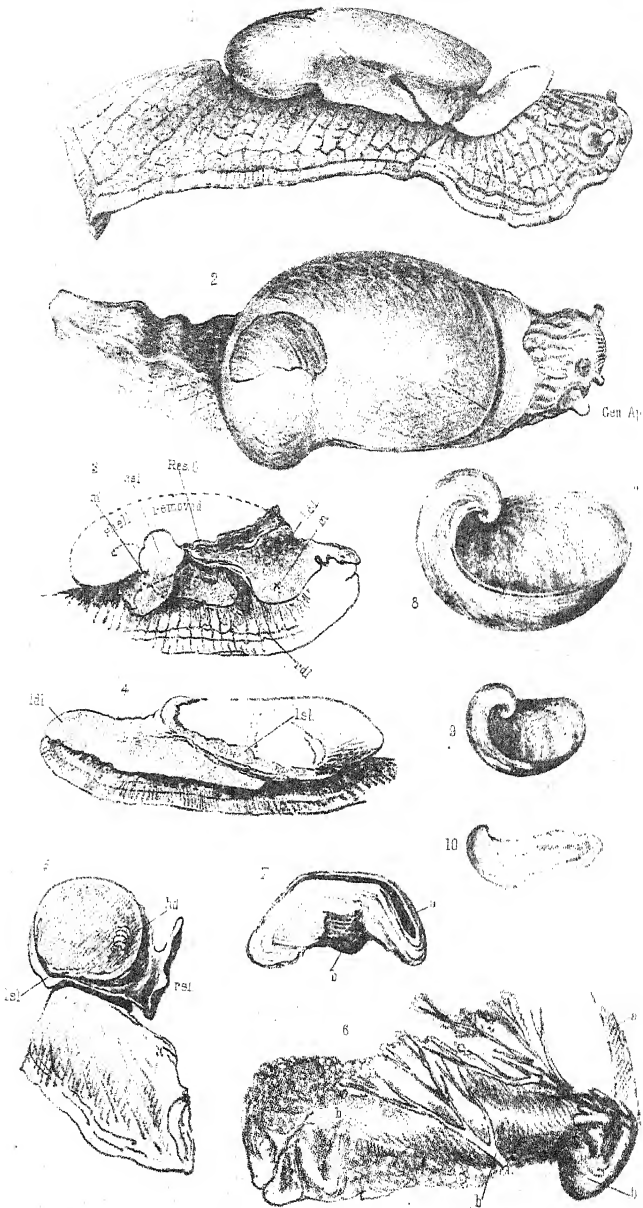
Dr. M. Watson read an account of the female organs of the Proboscidea, as observed in a specimen of the Indian Elephant which he had lately dissected.

This paper will be published in the Society's 'Transactions.'

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The following papers were read :—

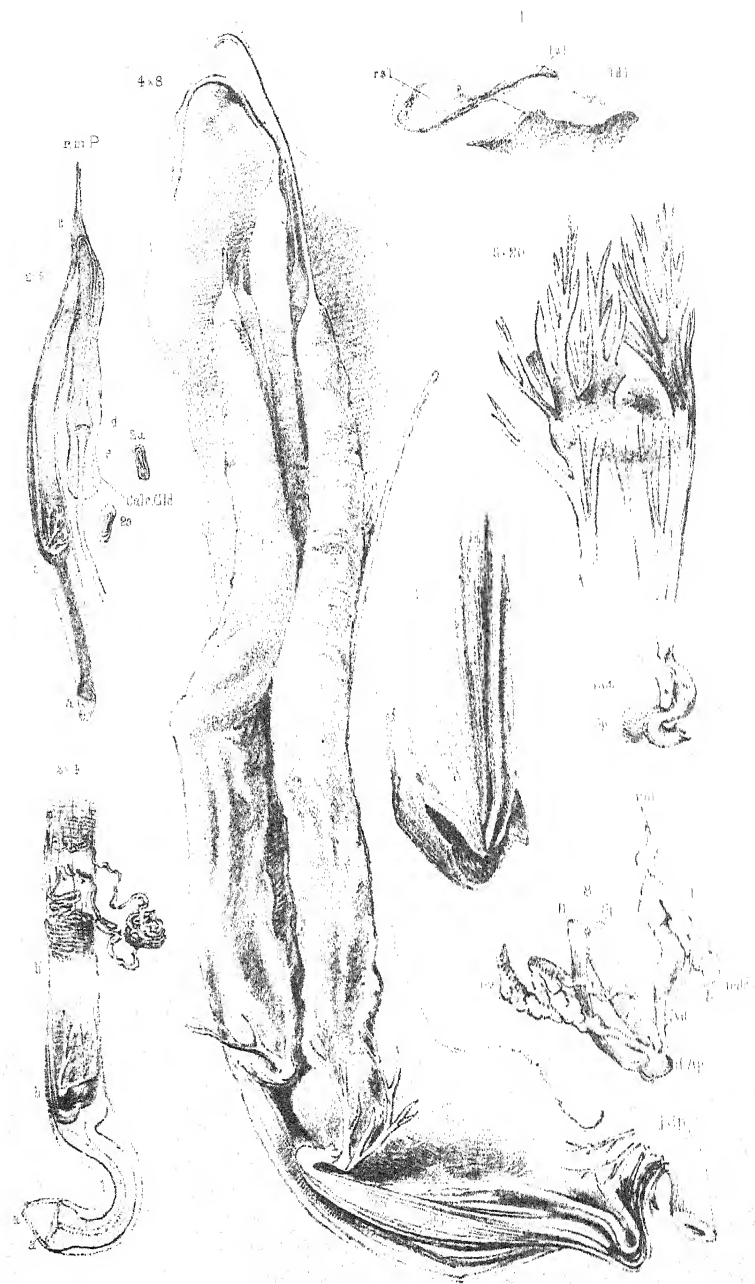












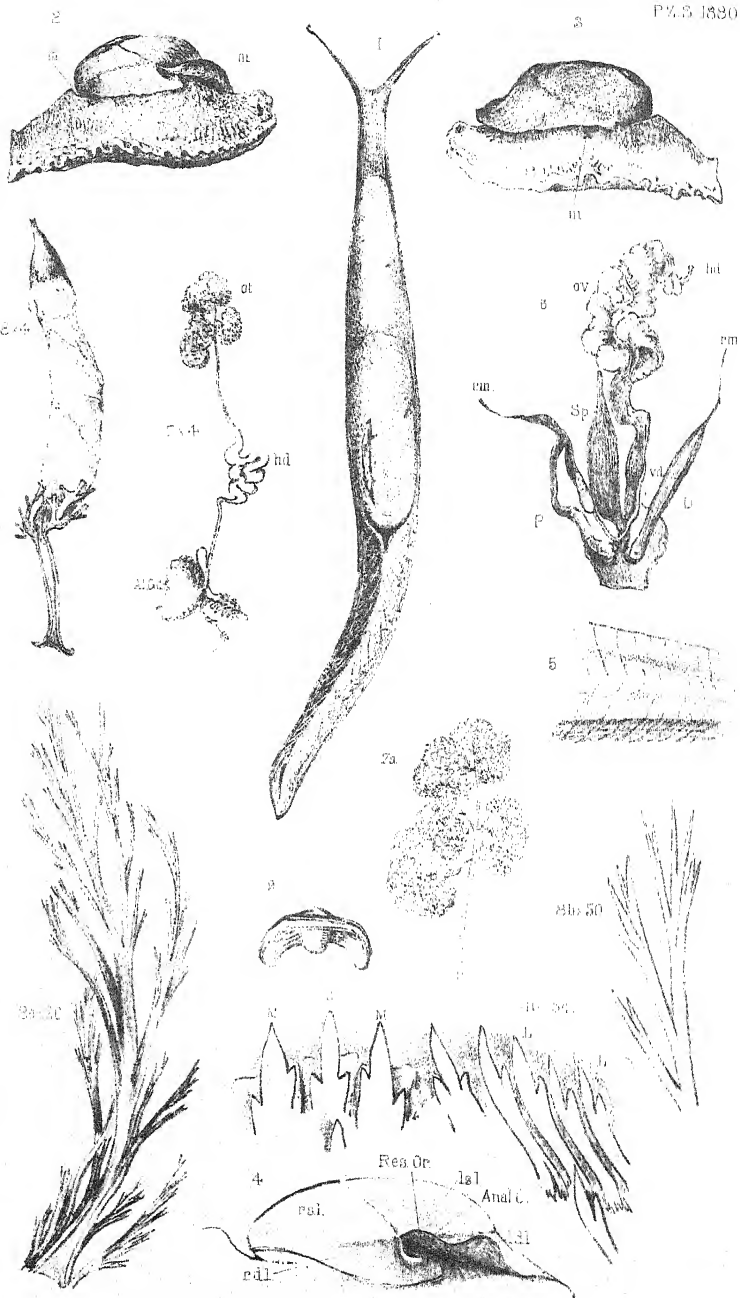
H.H. Godwin-Austen, del et lith.

THE LAND MOLLUSCAN  
GENUS *GIRASIA*

MacLure & Macdonald, imp.







- I. On the Land-Molluscan Genus *Girasia* of Gray, with Remarks on its Anatomy and on the Form of the Capreolus of Lister (or Spermatophore) as developed in Species of this Genus of Indian Helicidæ. By Lt.-Col. H. H. GODWIN-AUSTEN, F.Z.S., F.R.G.S., &c.

[Received March 15, 1880.]

(Plates XXIV.-XXVII.).

In certain groups of the Mollusca the many forms run so closely one into the other that it is not easy to find differences sufficiently well marked by which to characterize even the genera. The shells (which, as a rule, have alone been described) are often very similar; but in the animal itself, quite if not a more important part, very great diversity may be found in colour and markings, as well as in the complicated generative organs, amongst which the capreolus presents us with another specific point of difference.

This is one reason for my bringing it now more particularly to the notice of conchologists, as well as to show into what curious distinct forms it has been developed. I must state that I have not long taken up this part of the study of Malacology; and I trust that anatomists will deal leniently with any crudeness which must be inseparable from this communication.

When examining a large series of *Helices* which I had collected on the Eastern Frontier of India, I found that the body of many of them had dried up into the shell in a very perfect state. By placing these in cold water and allowing them to soak for 8 or 10 days in winter, I found that the odontophore, and in some cases even the genital organs, came out in a wonderfully perfect state of preservation. It was when examining one of these that I noticed the presence of a very hard chitinous organ (which I had never seen before) bent like a spring, from which projected at the basal end a series of long spinules: it tapered towards the posterior end, and terminated in a trumpet-shaped aperture, here also set with a few short spinules. Taking up the subject, I found that Ferd. Stoliczka had also detected and published the presence of this very peculiar chitinous organ in some species of the Indian *Zonitidæ*, and in two very different genera as regards the shells, viz. *Sesara infrendens* and *Macrochlamys honesta* (J. A. S. B. 1871, p. 242); and had he been spared longer to science, it was his intention to thoroughly examine all the Indian species he could get, and among them some of the slug-like forms hitherto placed in the genus *Helicarion*, which I am about to describe in more detail. Stoliczka suggested that the organ was one of irritation or titillation (p. 243, *l.c.*), also that it might represent the seminal receptacle or the arrow-sac; but Professor Semper afterwards pointed out (with reference to Stoliczka's paper) that it is a spermatophore.

Before describing or making any remarks of my own on this particular organ, it will be as well to refer to the works of other naturalists who have made the anatomy of the Mollusca their especial study, and then to compare and extend their valuable deductions to the Indian species now treated of.

M. A. Moquin-Tandon<sup>1</sup> (1851) and, later, M. P. Fischer have written on this organ of the Pulmoniferous Gastropods. In the 'Annales des Sciences Naturelles,' vol. vii. (1857), M. Fischer refers in terms of admiration and praise to the labours of Lister, who so far back as 1694 described and figured under the name of "capreolus" a curious organ, slender, thread-like, which is to be found in the genital apparatus of *H. pomatia* (Exercit. Anat. p. 115, tab. ii. figs. 4, 5, London). I will quote his own words:—"Nous donnons textuellement en note le assage de Lister relatif au *capreolus*; car il démontre le zèle et la sagacité qu'il apporta dans ses observations, alors que la zoologie comparée était encore à créer." Since Lister's time many naturalists have written on the subject, while some do not mention it at all when treating of the Land-Mollusca. Thus, Cuvier<sup>2</sup> says nothing of this organ in the fine monograph which he published on *Helix pomatia*; and various uses have been assigned to it. Draparnaud took the capreolus for the dart in *Helix vermiculata*.

Nitzsch (1826) notices it in *H. arbustorum* as not united to the genital organs, and had seen it come out a short way from the genital orifice; he did not attempt to explain its use, and called it the "corps énigmatique." Duverney, in *H. aspersa*, thought it condensed sperm. Van Beneden called it "un stylet" in *Parmacella*; Blainville, "un corps styloforme" in *Parmacella palliorum*. Dutrochet noted the spermatophore of *Arion rufus*, but did not interpret its meaning well; but Siebold, according to Fischer, foresaw its use: he says that it is "a slender body, of peculiar form, which in *Helix hortensis* and *H. arbustorum* is seen sticking out near the genital cloaca after fecundation, and which, when drawn in, is rolled up in a spiral at both extremities"<sup>3</sup>. Moquin-Tandon describes two different type forms in *Helix* and *Arion*. It has also been noticed in *Limax*, *Bulimus*, *Pel-tella*; and, summing up, we find:—

1. That nearly all naturalists are of opinion that it is only developed at the period of reproduction and has only a temporary existence<sup>4</sup>.

2. That it is a perfectly free body, not attached to the generative organs, and formed partly in the flagellum<sup>5</sup> and partly in the sheath of the penis.

There is only one exception given: in *Parmacella valenciennii*: M. Van Beneden concluded that it was a true organ and always present.

<sup>1</sup> 'Journal de Conchyliologie,' 23rd Dec. 1851, p. 333; and Comptes Rendus, vol. xli. p. 857, (1855).

<sup>2</sup> "Mémoire sur la Limace et le Limaçon," Ann. Mus. vii. (1806), p. 140.

<sup>3</sup> Baudelot, Ann. Sci. Nat. 1863, p. 136, gives a good history of the various papers on the subject of the generative apparatus of the Pulmonifera.

<sup>4</sup> P. Fisher Para, Annales des Sciences Nat. vii. (Zool.), p. 376 (1857).

<sup>5</sup> Moquin-Tandon, Comptes Rendus, 1855, p. 857

3. The capreolus apparently does not exist in some *Helices*; but as it is not always to be detected in *Helix aspersa*, these require more careful examination.

4. The capreolus serves to aid in the intromission of the seminal fluid, or rather the saving of it, and renders copulation more certain and intimate. Lister considered that the spinules of the capreolus retained the body in the female organ.

The more we know of the species of Indian Mollusca which have hitherto been placed in the genus *HELICARION* of Férussac (Tabl. Syst. 1821), of which a form, *H. curvieri*, Fér., was the type (from Australia), the more certain it is that few of the Indian forms, if any, can be retained in it. Of these, two or three are so very distinct they may safely be separated and also described in more detail.

Nothing is more satisfactory than to get hold of a type specimen of a genus; and acting on a note from my friend Mr. Geoffrey Nevill, and with the kind aid of Mr. Edgar Smith, I have been able to find and examine the type of Dr. J. E. Gray's genus *GIRASIA*, represented by a single specimen in spirit, which was collected by Sir Joseph Hooker in the Khasi Hills. It proves to be my *Helicarion* (*Hoplites*?) *theobaldi*, described in the P. Z. S. 1872, p. 517.

The subgenus *Hoplites* was proposed for these Khasi-Hill slugs by Mr. Theobald in the J. A. S. B. 1864, p. 244. No description of the genus or species is given, save that it was 2 inches long, from Teria Ghat, and was probably my *H. theobaldi*, l. c. p. 517. This group I now propose to start from, and take up first.

*GIRASIA*, J. E. Gray, Cat. Pulm. Brit. Mus. p. 61 (March 1855).

The original description (which I give below) is imperfect; no mention is made of the mucous gland, save in the synopsis of the generic section in which it is placed:—"Body united to the back of the foot, only separated by the convex hinder edges. Shell partly exposed, ovate, expanded, with a solid apex. Back of the neck (under the collar) with three grooves, the central groove between the tentacles double-edged; the lateral one single, bent down on each side to the sides of the head at the back of the lower tentacles<sup>1</sup>; the head is only partly retractile, so that the base of the upper tentacles, which are completely retracted, are exposed on the top of the head like two perforations<sup>2</sup>; the aperture of the generative organs is rather behind the base of the right tentacle. The hinder part of the body attached to the back of the foot nearly to its hinder end, which is separated from the deep concavity on the back of the foot by a deep lunate cross groove. In all these particulars the animal exactly agrees with the Portuguese species of *Drusia*"<sup>3</sup>.

Type *hookeri*, Gray. Khasi Hills.

These species are added:—

*Girasia*? *rutellum*, Hutton. Kandahar, Kabul. Evidently a *Parmacella*.

*Girasia extranea*, Fér. Habitat? (Hist. Moll. ii. 96.)

"Shell a thin horny pellicle, without any appearance of a spire."

<sup>1</sup> This sentence is not very clear or accurate.

<sup>2</sup> This is merely the description of the state of the spirit-specimen with the eye-tentacles inverted as usual.

<sup>3</sup> Then why was it separated?

*Girasia? problematica*, Fér., Hist. Moll. ii. 96. Habitat?

"Shell yellow, convex externally, concave internally, like a half eggshell."—Deshayes, from Férussac's figure. This is very unlike the type.

In the Appendix to Adams's Gen. Moll. p. 640, it is stated that Dr. Gray, in a communication to the author, proposed that these two last species should be placed in another new genus, *Rigusia*; and on the same page *G. hookeri* is put into *Cryptella*, a Canary-Island form with which it can have no possible affinity.

#### PARMARION, Fischer<sup>1</sup>.

Dr. Semper, in his fine work, Reis. Arch. Phil. p. 9, places in *Parmarion* two specimens, *pupillaris*, Humbert (*problematica*, Fér.?) from Java, and *extraneus*, Fér., obtained through Herr Pierre, and taken by him in Calcutta. I am in great doubts as to the identification of the latter species, which Semper figures on plate i. fig. 5. Mr. Nevill thinks it is *Helix bensoni* of Lower Bengal. No forms like the Khasi-Hill *G. hookeri* have been taken in Calcutta. If it was found in the Botanical Gardens there, it may have been brought from up the country in baskets of plants. Several imported species have been in this way introduced there from time to time; and some may have become established. I do not think myself it is *H. bensoni*; the shell is too much covered with the mantle, especially for a spirit-specimen.

In Nevill's Hand-list of the Indian Museum, Calcutta, p. 13 (1878), in *Parmarion* he includes two species of typical *Girasia* from the Khasi Hills, *croceus* and *brunneus*, and creates a new sub-genus, *Austenina* (type *Vitrina gigas* of Benson, from the Khasi Hills), to include all those species with better-developed shells, which could not be placed in *Helicarion*, and which I had pointed out were different from Theobald's slug-like forms known to us then as *Hoplites*. He included in this group *Hoplites magnificus*, *resplendens*, *peguensis*, *solidus*, *auriformis*, *heteroconcha*, and two others unnamed from Darjiling.

I had myself brought home from India a good many specimens in spirit; and I have lately received from Mr. Ogle, of the Topographical Survey, to whom my very best thanks are due, another lot

<sup>1</sup> PARMARION, Fischer, Actes Soc. Linn. Bordeaux, 1855. (The paper bears date June 1855, the part 15th March, 1856; so that Mr. Gray's title has priority.)

Fischer places in it the following species:—

*infumatus*, Fér. (Gray, Fig. Moll. plate 286. fig. 1). Hab.? (Placed in *Drusia*, by Gray.)

*extraneus*, Fér. (Gray, Fig. Moll. plate 286. fig. 2). Hab.?

*rangianus*, Fér. Bourbon and Madagascar. (Placed in *Drusia?* by Gray.)

*problematicus*, Fér. (Gray, Fig. Moll. plate 286. fig. 4). Hab.?

From the drawing of *infumatus*, by Férussac, one would be led to suppose that the shell is very rudimentary, and entirely concealed by the mantle-lobes. Unfortunately the habitat of this species and *extraneus* is unknown. I, however, should place in Fischer's genus all those species in which the shell is so little developed, and take as our N.E.-frontier type, *P. rubrum*, G.-A., from the Naga Hills (J. A. S. B. 1875, p. 6, pl. ii. fig. 4), which will require hereafter a close comparison with the Javan forms.

from Shillong, all of typical *Girasia*. These have furnished me with the means of more accurately describing the genus.

*GIRASIA SHILLONGENSIS*, G.-A., J. A. S. B. January 1875, p. 4, pl. ii. f. 1, 1a.

The following will be an emended description of the genus:—

Shell rudimentary, horny, narrow, elongate, of one simple whorl; colour olivaceous, apex white, the central portion of the inside of the shell covered with a milky-white callus. About 1 inch long. (Plate XXIV. fig. 10.)

Animal slug-like, long, mantle largely developed; shell and dorsal lobes are united all round; and the shell is entirely covered by the former, with the exception of a narrow area on the posterior left margin. From the anterior right margin of this area a well-marked cicatricial line runs forward to just above the respiratory and anal orifice, and marks the usual division of the shell-lobes in other species into a left (frontal) and right (posterior). The dorsal lobes are divided diagonally forward from the respiratory orifice into a large left dorsal lobe and (behind and adjacent to the orifices) a smaller right dorsal lobe; on the extreme posterior side a slight beading marks the junction of these lobes with the shell-lobes above. This portion of the animal is sunk into a deep V-shaped depression in the back, where the dorsal ridge of the foot terminates suddenly. Extremity of the foot truncate, with a large linear mucous gland; the pedal line is very distinct.

Genital aperture near the lower and outer base of the right tentacle.

The foot is divided longitudinally into three subequal median and lateral areas, and is distinctly segmented, the major divisions on the pallial edge of the foot being continued in V-shape from one side to the other, the angle being directed backwards in the spirit-specimen; but they are no doubt straight when the animal is alive.

*Generative organs of G. shillongensis*.—In every way similar to *G. gigas*, Bs. The ovo-testis consists of five separate bunches or lobes of very minute globular follicles, each lobe having a separate duct leading to the main hermaphrodite duct; this gradually widens, and becomes much thickened, with several sharp convolutions; it then suddenly contracts again, leading to the junction of the albumen-gland. Here a short pear-shaped cæcum is conspicuous (only seen in one specimen).

The albumen-gland was not perfect, but appeared as if formed of two lobes (from above specimen).

The prostate was wide, ribbon-like; the oviduct with three or four great folds, which extend to the posterior termination of the spermatheca, which is not so long as to be infolded by it. The vas deferens is given off a very short distance below the end of spermatheca, high up the oviduct; and it extends backwards to near the base of the penis and amatory organ, in a loop, to join the former close behind a cæcum-like appendage rounded at the end (the cæcum calciferum). The penis is bent on itself, where a long process is given off, to which the retractor muscle is attached. The ama-

tory organ (dart-sac) is a long cylindrical body, becoming finer towards the posterior end; its retractor muscle has its attachment with that of the penis, close below the apex of the shell, in the body-cavity.

The spermatheca is of the same size as the latter, and in this specimen presents a swollen sac below, terminating in a short, thin, cylindrical point, which is buried and attached where the convolutions of the ovo-testis commence.

The spermatophore is similar to that of *Austenia gigas*, but rather shorter, the sac being 0.3 inch long. The cervicorn processes at the base are strong and numerous, much branched above (see Plate XXVII. fig. 8). The basal duct is 0.2 in length. Three of these were found in the spermatheca examined.

*List of species of Girasia.*

- |   |  |
|---|--|
| 1. <i>hookeri</i> , Gray (Plate XXVII. figs. 2, 3), = <i>G. theobaldi</i> , G.-A., Khasi. | 5. <i>nagaensis</i> , G.-A., Naga.   |
| 2. <i>crocea</i> , G.-A., Khasi.  | 6. <i>magnifica</i> , Nev. & G.-A. (Plate XXIV. figs. 1, 2), Upper Burmah. |
| 3. <i>shillongensis</i> , G.-A., Khasi.   | 7. <i>radha</i> , G.-A., Assam.  |
| 4. —, var. <i>brunnea</i> , G.-A. (Plate XXVII. fig. 1), Khasi.                           | 8. <i>burtii</i> , G.-A., Assam.   |
|   | 9. <i>peguensis</i> , Th., Pegu.   |

*AUSTENIA GIGAS.* (Plate XXIV. fig. 8, shell.)

*Vitrina gigas*, Benson, J. A. S. B. vol. v. (1836), p. 350.

*Helicarion gigas*, Godwin-Austen, J. A. S. B., vol. xlv. (1875), plate iii. (animal).

*Vitrina gigas*, Theobald & Hanley, Conch. Ind. pl. lxvi. figs. 2, 3.

*Helicarion* (sec. B.) *gigas*, Theobald, Cat. L. & F.W. Shells of B. India, p. 23, 1876.

*Helicarion gigas*, var. *minor*, J. A. S. B. vol. xlv. 1875, pl. iii. (animal).

*Austenia gigas*, G. Nevill, Hand List Indian Museum, 1878, p. 16 (no description).

Shell ovate, broad, whorls about  $1\frac{1}{2}$ ; apex depressed; body-whorl large and flatly expanded, with a shining lustre; colour olivaceous, with sienna-brown, pale at apex, somewhat nacreous within. One specimen is all sienna-brown and milky-white within (Plate XXIV. fig. 9).

Typical from Teria Ghat, Khasi Hills. Largest example: major diam. 1.7 inch, minor diam. 1.2 inch. Another: major diam. 1.53 (= 38.5 m.), minor diam. 0.95 (= 24.5 m.).

Var. *minor*<sup>1</sup>. Naga Hills. Shell: major diam. .84 inch (21.5 m.), minor diam. .55 inch. (18 m.). Of same form as *gigas*, but with a fine glassy lustre and olivaceous brown. Animal spotted.

Small var. North Khasi. Shell: major diam. 1.0 inch (25.5 m.), minor diam. 0.68. Animal brown.

Pale grey (dissected) var. Burmah? from G. Nevill. Shell: major diam. 0.95 inch (25.5 m.), minor diam. 0.75 (19.0 m.).

<sup>1</sup> May be *Helicarion resplendens*, Nevill, J. A. S. B. 1877, p. 23.

*Animal*.—The left dorsal lobe (*l.d.l.* Plate XXIV. figs. 3, 4, 5) is large in front, and extends from the respiratory orifice to the left margin. The right dorsal lobe (*r.d.l.*) extends from the same part to the posterior right margin. The shell-lobes are connected all round the periphery of the mantle-zone, but are reduced in size, and present two distinct right and left contractile lobes; the right extends to and covers the apex of the shell, while the left extends over the edge of the body-whorl for a distance of 0·3 to 0·5 inch, leaving the posterior and the greater portion of the upper surface of the shell uncovered (we have here a true approach to what is seen in the subgenus *Macrochlamys*). The posterior margin of the shell is not sunk in a depression of the hinder part of the foot, but the upper surface of the foot extends in an unbroken ridge to the mantle-zone.

Extremity of the foot truncate, with a large linear mucous gland, the pedal line very distinct, as well as the lateral markings on the surface of the body.

Genital aperture at the lower and outer base of the right tentacle.

Animal reaches quite 4 inches in length.

*Description of Genital Organs of A. gigas*. Small var., Khasi Hills (Plate XXV. fig. 1).—The ovo-testis was not seen; the hermaphrodite duct (*h.d.*) is much convoluted at the anterior end, where it divides; the shape of the albumen-gland was also unobserved, and had apparently not been preserved in the spirit. The oviduct (*ov.*) was very closely convolute, and arranged in four sharp folds upon the posterior portion of the spermatheca (*sp.*), to which it is apparently held by muscular tissue. The prostate is wide, regular, and ribbon-like, much and closely convolute, giving off the vas deferens not far above the junction of the spermatheca with the oviduct; this is very long, extending forward between the inverted eye-tentacles, forming a loop among the muscles of the buccal mass.

The penis is bent on itself at the point where the retractor muscle is given off (*Pc.* fig. 4); and a short, blunt, rounded portion extends beyond the insertion of the vas deferens (*pd.*), corresponding to the flagellum in some species, or the Kalksack of Semper (the cæcum calciferum vasis deferentis).

The retractor muscle of the penis has its attachment, together with the eye-tentacles, in the usual position, close below the apex of the shell, near the posterior margin of the body-cavity (Plate XXIV. fig. 3 m).

*Detailed Anatomy of Penis of G. gigas* (Plate XXVI. figs. 2, 3). On the removal of the outer muscular sheath, the anterior end is of a hollow cone-shape (*a*), which, on being cut away, presented within a cup-shaped depression (*a'*), and exposed the duct of the penis. It contracts suddenly, and continues as a smooth stout tube of equal size for about 0·25 inch, where it expands again (*b*) into a stouter portion of cylindrical form, which is 0·55 inch long, and continues, with gradually lessening thickness, up to the part where it is turned suddenly backwards, and close to where the retractor muscle is given off (*c*). On removing the outer layer a chitinous sheath was exposed lying



against the thin membrane beneath (*b' b*); and following this down, it was found to be the basal end of the spermatophore, with the peculiar cervicorn processes at the base, *in situ* where developed. On opening the membranous sac, it was found to consist of one continuous thread coiled down on itself (fig. 3), and pressed closely together, and was in such good preservation as to be easily unravelled. I drew out and measured a portion  $\frac{1}{10}$  inch in length, and found it to contain 15.1 inches; the whole length of this part being .55 inch in length, would give nearly 7 feet for the total contents of the sac. It is, in fact, a spermiatic thread of hardened spermatozoa, poured out from the vas deferens<sup>1</sup>.

On further examining the part near *c*, this cylindrical portion was found to end in a conical cap, which again gave off a thin rod, which bending sharply back, is evidently in communication with the extension of the vas deferens towards *d*. Behind the junction of this last is a short gland rounded at the end (*e*), which contained some very microscopic transparent crystalline bodies of oval form (fig. 2, *a*). This is the Kalksack mentioned above, and secretes the material for the formation of the spermatophore.

This spermatophore, which is an organ of a very complicated and curious form, may be thus described:—The basal or anterior end consists of a chitinous strap about 0.4 inch long, with the sides more or less turned over, forming a sort of trough or long spout, which, after it has passed into the spermatheca of the other individual, will be found opening into the lower part of the oviduct. At the other end the sides at last meet and form a tube; it then thickens and widens, giving off several strong cervicorn or more or less branched processes, which are directed backwards; they serve, I think, to aid in the expulsion of the spermatophore from the penis, and, when once within the spermatheca or vagina, serve as holding-hooks to prevent its withdrawal. The part above this consists of a very long thin membranous bag 0.4 inch long, terminating in a hard conical cap, from which proceeds a thin rod, which is found to extend to the hard rounded apex of the spermiatic sac, where it bends over or ends in a few separate filaments within the tube of the vas deferens. In one specimen of this species (*gigas*) no less than seven perfect spermatophores were counted, closely packed together side by side within the spermatheca. (Van Beneden observed two in a *Parma-cella*, Ann. Sci. Nat. 1857, p. 371.)

It would appear that in these creatures even one act of copulation would fertilize for a very considerable period; for it would be some time before the contents of a spermatophore became exhausted.

This organ, as situated in the penis, presents the character of a perfect spring (*vide* Plate XXVI. figs. 2, 3); and it can be imagined that when it enters the wider and very elastic sac of the spermatheca, and is then gradually released, it will tend to become quite straight, and that, the recurved processes holding it at one point, the longer portion will bend round to the long axis of the sac, bringing the end

<sup>1</sup> This thread is similarly described by M. Baudelot, *l.c.* p. 165, in his description of the capreolus of *Arion rufus*.

of the shorter portion (Plate XXVI. fig. 3, *a*) to the aperture within the vagina and ovo-testis (Plate XXVI. fig. 4, *j. sp.*).

*Macrochlamys decussata*, of which I have a drawing, taken when the animals were *in coitu*, protruded a large white bladder-like sac, which expanded and contracted from time to time as if inflated with air; this I now think may have been the spermatheca drawn out and receiving the penis and capreolus.

In the two specimens I examined, the spermatheca (*sp.*) was elongate, smooth, lying close to and partly enveloped by the convolutions of the oviduct &c., with its posterior end near the junction of the hermaphrodite duct and albumen-gland. This posterior termination is bent over on itself, presenting a smooth rounded end (Plate XXV. figs. 2 & 4), which, coiling round, terminated, and was covered with what was apparently muscular tissue buried in the prostate and oviduct. The form of the spermatheca is due to its contents; and the rounded end is produced by the bending-over of the flagellum-like terminations of the enclosed spermatophores.

In one specimen of *G. hookeri* which I examined, probably taken in the cold weather, all the generative organs are small and contracted, the spermatheca only represented by an attenuate sac.

The amatorial organ or dart-sac (*D*)<sup>1</sup> is a long cylindrical body narrowing towards the genital aperture, and again swelling there into a large orifice; it has a very thick and muscular structure, and in these spirit-specimens is very hard and unyielding. When cut open longitudinally, the dart or *spiculum amoris* was found to be a simple cylindrical rod, sharply pointed (Plate XXVI. fig. 7). This organ has a strong retractor muscle, with its attachment near that of the penis.

*Relative Position of the different Parts in G. gigas.*—On cutting through the skin of the upper side of the back, commencing from between the eye-tentacles, the penis is seen lying in the middle line between the inverted eye-tentacles (Plate XXV. fig. 2); on the proper left of it are seen three large convolutions of the intestine (*i*); and on laying it over to the right side the salivary glands of flattened form are seen spreading over these, and a distinct connexion with the central convolution was very clearly made out (fig. 5, *a*). Proceeding from the sides of the buccal mass will be noticed two strong muscles, which have their attachment on the frontal margin of the body-cavity, at the point (Plate XXIV. fig. 3) *m*; these are the retractor muscles of the head and buccal mass.

The spermatheca lies on the right side of the animal, covered partly by the oviduct; and a large expansion of the intestine occupies the posterior portion of the cavity, narrowing suddenly to enter that of the shell above.

A very large mucous gland lies next the sole of the foot along the whole length of the body-cavity; and two large pedal nerves are conspicuous and traverse it, throwing off nerves to the epidermis, and extend onto the caudal gland.

<sup>1</sup> Glandula mucosa cum sagittâ amatoriâ.

*List of species of AUSTENIA.*

<i>gigas</i> , Bs., Khasi.	<i>cinerea</i> , G.-A., Daffa.
<i>gigas</i> , var. <i>minor</i> , Naga.	<i>salia</i> , Bs., Khasi.
<i>gigas</i> , small var., Khasi.	<i>venusta</i> , Theob.?, Burmah.
<i>solida</i> , G.-A., Khasi.	<i>resplendens</i> , Nevill, Upper
<i>minutu</i> , G.-A., Daffa.	Burmah.

Still retained provisionally in *HELICARTON*.

<i>verrucosum</i> , G.-A., Daffa.	<i>cassida</i> , Hutt. & Bs., W. Hima-
<i>ovatum</i> , Hy. Blf., Darjiling.	laya.
<i>bensoni</i> , Pfr., Calcutta.	<i>birmanicum</i> , Phil., Mergui.
<i>planospira</i> , Bs. (= <i>succina</i> , Reeves?), Darjiling.	<i>heteroconcha</i> , Hy. Blf., Darjiling.
<i>scutella</i> , Bs., Kashmir.	<i>membranaceum</i> , Bs., Ceylon.
<i>flemingianum</i> , Pfr., Sindh.	<i>edgarianum</i> , Bs., Ceylon.
<i>christianæ</i> , Theob., Andaman.	<i>layardi</i> , Bs., Ceylon.
<i>irradians</i> , Pfr., Ceylon.	<i>extraneum</i> , Fér., Calcutta?
<i>monticola</i> , Bs., W. Himalaya.	<i>tennentii</i> , Temp.?, Ceylon.
	<i>præstans</i> , Gould?, Tenasserim.
	<i>auriforme</i> , W. Blf., Nilgiri Hills.

## EXPLANATION OF THE PLATES.

## PLATE XXIV.

- Fig. 1 & 2. Animal of *Girasia magnifica*, nat. size. Specimen in Indian Museum, Calcutta. *G.ap*, genital aperture, showing the end of the amatorial organ projecting from it.
3. *Austenia gigas*, small var. View of right side, showing the respiratory and anal orifices. *r.d.l.*, right dorsal lobe; *l.d.l.*, left dorsal lobe; *r.s.l.*, right shell-lobe; *l.s.l.*, left shell-lobe.
4. The same. View of left side.
5. The same. Viewed from the back, apical portion cut off. *h.d.*, position of the hermaphrodite duct.
6. Portion of capreolus of *A. gigas*, small var. *a*, strap-like basal portion; *b'*, base of sac, with cervicorn processes; *b''*, the membranous sac.
7. Jaw of *A. gigas*. *a*, cleft in which the muscles of the upper lip are inserted; *b*, lower free edge.
8. Shell of *A. gigas*, Bs., nat. size.
9. *A. gigas*, var. *minor*, G.-A., nat. size.
10. *Girasia shillongensis*, G.-A., nat. size.

## PLATE XXV.

- Fig. 1. Genital organs of *Austenia gigas*, small var. Khasi Hills. Side view.
2. The same, seen from above.
3. Intestine, salivary gland, &c., viewed from above.
4. Genital organs removed from the animal.
5. Basal portion of the spermatheca.
- j.sp.*, point of attachment to oviduct; *a*, strap-like portion of the capreolus; *h.d.*, hermaphrodite duct; *al.gld.*, albumen-gland; *ov.*, oviduct; *v.d.*, vas deferens; *D*, dart-sac; *P*, penis; *Pe.*, cæcum calciferum; *Sp.*, spermatheca; *r.m.p.*, retractor muscle of penis; *mu.gld.*, mucous gland; *i.*, intestine; *m.*, retractor muscle of head and buccal mass.

## PLATE XXVI.

- Fig. 1. Shell and neck-lobes of *Austenia gigas*, var. *minor*, G.-A.
2. Penis of *A. gigas*, Bs., showing the position of the capreolus or spermatophore during the period of development,  $\times 3$ . *2 a*. Concretions from calciferous gland or Kalksack.

- Fig. 3. The same,  $\times 4$ . Showing the sac filled with spermatie coil.  
 4. Spermatophores as seen lying within the spermatheca of *A. gigas*,  $\times 8$ .  
 5. The cervicorn processes of the capreolus of *A. gigas*, var. *minor*,  $\times 20$ .  
 6. Junction of the spermatheca and oviduct in *A. gigas*,  $\times 4$ .  
 7. The anatory organ or dart-sac, cut open, exposing the dart, much enlarged.  
 8. Generative organs of *A. gigas*, var. *minor*, nat. size.

## PLATE XXVII.

- Fig. 1. Animal of *Girasia brunnea*, Godw.-Aust., from nature, nat. size.  
 2. Spirit-specimen, *G. hookeri*, Gray. View of right side, nat. size.  
 3. The same. View of left side, nat. size.  $\times$  points where muscles are attached internally.  
 4. Mantle showing lobes, respiratory and anal orifices, enlarged.  
 5. Portion of the foot, showing segmentation, of *G. shillongensis*.  
 6. Generative organs of *G. shillongensis*, G.-A., nat. size.  
 7. The ovo-testes and hermaphrodite duct to the albumen gland in *G. brunnea*,  $\times 4$ .  
 7 a. Ovo-testis under higher power.  
 8. The capreolus or spermatophore of *G. shillongensis*,  $\times 4$ .  
 8 a. One of its branch-like processes broken off,  $\times 20$ .  
 8 b. Terminal point,  $\times 50$ .  
 9. Jaw of *A. gigas*, var. *minor*,  $\times 8$ .  
 10. Teeth of the odontophore in same species,  $\times 340$ . C=central; M=median; L=lateral.

## 2. On the Duration of Life of the Animals in the Zoological Garden at Frankfort-on-the-Main. By Director Dr. MAX SCHMIDT.

[Received March 18, 1880.]

He who has occupied himself with the rearing and keeping of animals, is well aware of the care and attention that are needful to succeed, and that, in spite of the greatest pains, he is not always free from failure. The director of a zoological garden has more occasion than other persons to make this experience. His wards, so manifold in shape, constitution, and disposition, require every moment his circumspection, precaution, and perseverance. Again and again he is compelled to devise new means of relief and expedients to preserve the feeble health and the so-easily-destroyed life of the poor creatures that come to his hands, often heavily damaged by conveyance. Many a time he would be happy to avail himself of the experience of others; but he misses sadly all literary resources; for although, in the course of the last 20 years, zoological gardens of considerable account have been established in different parts of the continent, subsidiary books and periodicals, containing communications about particulars of importance for the keeping and management of animals, are very scarce.

The Zoological Society in Frankfort-on-the-Main early conceived the importance of such publications, and for this purpose founded the professional newspaper the 'Zoological Garden,' which has arrived at

its twenty-first anniversary. In this Journal I have recorded my observations, and not only those referring to the living animal, but at the same time those respecting the symptoms of disease previous to death, and the anatomical results of the autopsy.

On the keeping of birds there exists a comparatively rich literature; and special periodicals treat of this matter.

Now it would be of great use if the age the different animals are able to arrive at could be ascertained; and in order to contribute my share of experience, I added my own knowledge to the few notices I could find in literature, and published them two years ago.

I note with satisfaction that my example has been followed by the Zoological Garden of Hamburg.

For further completing these statistics I have drawn up the following two summaries. The first contains the duration of life of the different animals in our garden, as far as it could be ascertained, while the second expresses the average amount of life-time of the individual specimens of the different classes of Mammals and Birds.

In reference to the first, I have to add that the record has been continued up to the 31st of December, 1879, and states how long the still living animals have been in our garden. It is evident that the numbers denote the real age only of those animals that were born there, while to that of the others the time they have lived before coming to our hands must be added. This difference cannot be estimated as very great, as the animals are generally acquired in their youth.

Of course it is impossible to point out the age of every single specimen we have ever possessed, but only such numbers have been chosen as are sufficient to show distinctly how long such an animal is at all able to live. No notice has been taken of exceedingly short periods of existences, as it must be presumed that adverse circumstances were the cause of them. Wherever it was feasible the time of life has been given strictly to a day. In other cases only the number of years is recorded; and there can be, at the utmost, a difference of but a few months, more or less.

Out of a greater number of statements concerning the same class, only those have been selected that show the principal variations of length of life. The numbers relating to animals that were still living on the 31st of December 1879 are marked with asterisks (\*).

The time of observation has not in all cases proved long enough for definite statements—some of the animals having been in our keeping only for a short time, while others that have lived in our Garden from its beginning are still enjoying life and health, and promise to live on for some time longer.

Names of the animals.	Duration of life.			
	Approximate.	Ascertained.		
	years.	years.	months.	days.
MAMMALIA.				
QUADRUMANA.				
Chimpanzee ( <i>Anthropopithecus troglodytes</i> ).	....		5	2
			5	28
		1	5	20
Orang-Outang ( <i>Simia satyrus</i> ) .....	....		3	4
		*1	10	4
Grivet Monkey ( <i>Cercopithecus griseo-viridis</i> ).	....	1	11	3
Patas Monkey ( <i>Cercopithecus ruber</i> ) ..	....	1	0	5
		1	0	27
		2	1	20
		2	2	20
Mona Monkey ( <i>Cercopithecus mona</i> ) ..	....	1	9	5
			3	21
		1	7	11
White-collared Mangabey ( <i>Cercocebus collaris</i> ).	....	2	1	13
		3	0	27
		3	7	29
		1	0	25
Sooty Mangabey ( <i>Cercocebus fuliginosus</i> )	....	7	2	11
		2	3	11
		1	2	10
		*1	6	7
Bonnet-Monkey ( <i>Macacus radiatus</i> ) ..	....	*6	6	13
		*5	6	17
		*5	3	19
		*1	7	12
		1	8	23
		1	3	15
Macaque Monkey ( <i>Macacus cynomolgus</i> )	....	13	9	16
		12	7	14
		3	11	5
		4	3	6

Names of the animals.	Duration of life.			
	Approximative.	Ascertained.		
		years.	months.	days.
Pig-tailed Monkey ( <i>Macacus nemestrinus</i> ).	....	1	5	10
		2	5	5
Rhesus Monkey ( <i>Macacus erythræus</i> )	....	5	11	18
		3	5	27
		4	4	25
Wanderoo Monkey ( <i>Macacus silenus</i> )..	....	8	10	27
Ashy-black Macaque .....	....	1	3	29
		1	6	19
Barbary Ape ( <i>Macacus inuus</i> ) .....	....	3	4	5
Black Ape ( <i>Cynopithecus niger</i> ).....	....	1	0	22
		1	2	23
		3	6	6
Arabian Baboon ( <i>Cynocephalus hama-dryas</i> ).	....	13	8	22
Anubis Baboon ( <i>Cynocephalus anubis</i> )	....	13	5	17
		4	9	18
Yellow Baboon ( <i>Cynocephalus babuin</i> )	....	*9	7	16
Guinea Baboon ( <i>Cynocephalus sphinx</i> )	....	*16	7	0
Drill ( <i>Cynocephalus leucophæus</i> ) ....	....	14	0	19
		3	10	11
		3	10	17
Black-faced Spider Monkey ( <i>Ateles ater</i> )	....	1	9	12
Black-fronted Spider Monkey ( <i>Eriodes frontatus</i> ).	....	3	5	16
		*1	3	2
Capuchin ( <i>Cebus capucinus</i> ) .....	7, 10, or 11	4	11	22
		4	0	7
		5	3	4
		6	4	16

Names of the animals.	Duration of life.			
	Approximate.	Ascertained.		
		years.	months.	days.
Three-banded Douroucoul ( <i>Nyctipithecus trivirgatus</i> ).	....	3	0	2
Squirrel Monkey ( <i>Chrysothrix sciurea</i> )	....	*1	3	23
Common Marmoset ( <i>Hapale jacchus</i> )	....	1	1	21
Ruffed Lemur ( <i>Lemur varius</i> ).....	....	*3	7	6
Mongoose Lemur ( <i>Lemur mongoz</i> ) ....	....	1 3	3 10	4 1
Black-headed Lemur ( <i>Lemur brunneus</i> )	....	3 4	11 0	25 26
White-fronted Lemur ( <i>Lemur albifrons</i> )	....	*2	1	26
Red-bearded Lemur ( <i>Lemur xanthomystax</i> ).	....	*4	3	21
Galago ( <i>Otolicnus senegalensis</i> ) .....	....	*2	2	8
CHIROPTERA.				
Indian Fruit-Bat ( <i>Pteropus medius</i> ) ..	....	1	6	5
CARNIVORA.				
Lion ( <i>Felis leo</i> ) .....	....	*10 8	1 4	7 27
Tiger ( <i>Felis tigris</i> ) .....	....	*8	0	4
Leopard ( <i>Felis pardus</i> ) .....	....	11 4 5	4 5 3	29 26 26
Angora Cat .....	....	8 8	3 7	9 23
Striped Hyæna ( <i>Hycæna striata</i> ).....	....	*7	9	9



Names of the animals.	Duration of life.			
	Approximative.	Ascertained.		
	years.	years.	months.	days
Common Genet ( <i>Genetta vulgaris</i> )....	....	4	11	12
Common Paradoxure ( <i>Paradoxurus typus</i> ).	....	4	4	3
Egyptian Ichneumon ( <i>Herpestes ichneumon</i> ).	....	3	5	3
Common Wolf ( <i>Canis lupus</i> ) .....	....	12	2	27
Common Badger ( <i>Meles taxus</i> ) .....	....	2	11	9
Common Otter ( <i>Lutra vulgaris</i> ).....	....	*5 *4 8	2 8 5	10 8 23
Raccoon ( <i>Procyon lotor</i> ) .....	....	4 5	11 4	27 29
White-nosed Coati ( <i>Nasua narica</i> )....	5			
Polar Bear ( <i>Ursus maritimus</i> ) .....	....	18	0	1
Brown Bear ( <i>Ursus arctos</i> ).....	....	*21 *16	4 3	25 25
Syrian Bear ( <i>Ursus syriacus</i> ) .....	....	7 7	0 8	18 7
Common Seal ( <i>Phoca vitulina</i> ) .....	....	2	5	2
RODENTIA.				
Common Squirrel ( <i>Sciurus vulgaris</i> ) ..	....	5	4	3
Grey Squirrel ( <i>Sciurus cinereus</i> ).....	....	*5 3	9 6	10 23
Hudson's-Bay Squirrel ( <i>Sciurus hudsonius</i> ).	3½	4	3	2

Names of the animals.	Duration of life.			
	Approximate.	Ascertained.		
	years.	years.	months.	days.
Vulpine Squirrel ( <i>Sciurus vulpinus</i> ) ..	....	2	10	13
		2	11	18
		5	2	1
Red-bellied Squirrel ( <i>Sciurus variegatus</i> )	....	3	4	29
American Flying Squirrel ( <i>Sciuropterus volucella</i> ).	....	1	1	21
Japanese Flying Squirrel ( <i>Pteromys momoga</i> ).	....	*4	1	8
Chipping Squirrel ( <i>Tamias striatus</i> ) ..	4			
European Souslik ( <i>Spermophilus citillus</i> )	....	3	0	21
Alpine Marmot ( <i>Arctomys marmotta</i> )..	7	3	6	13
		6	8	18
		*6	9	20
		7	5	12
European Beaver ( <i>Castor fiber</i> ) .....	....	*6	1	28
Crested Porcupine ( <i>Hystrix cristata</i> )..	....	6	5	8
Agouti ( <i>Dasyprocta aguti</i> ) .....	8			
MARSUPIALIA.				
Bennett's Wallaby ( <i>Halmaturus bennetti</i> ).	4	*5	3	15
Rat-Kangaroo ( <i>Hypsiprymnus murinus</i> )	6-7			
Rabbit-eared Perameles ( <i>Perameles lagotis</i> ).	....	4	0	22
		7	2	0
Common Wombat ( <i>Phascolomys wombat</i> )	....	15	9	14
EDENTATA.				
Two-toed Sloth ( <i>Cholopus didactylus</i> )..	....	4	5	29

Names of the animals.	Duration of life.			
	Approximate.	Ascertained.		
		years.	years.	months.
EQUIDÆ.				
Burchell's Zebra ( <i>Equus burchellii</i> ) ..	....	13	16	0
		*15	7	19
		*9	7	21
		*6	8	22
<i>Equus caballus nanus</i> from Iceland....	....	*12	6	23
		*10	6	5
PACHYDERMATA.				
Indian Elephant ( <i>Elephas indicus</i> )....	....	*16	6	0
African Elephant ( <i>Elephas africanus</i> )	....	*5	4	4
Wild Swine ( <i>Sus scrofa</i> ) .....	....	9	0	13
		4	10	5
Masked Pig ( <i>Sus pliciceps</i> ) .....	....	5	6	7
		6	9	26
RUMINANTIA.				
Common Camel ( <i>Camelus dromedarius</i> )	....	16	5	12
Bactrian Camel ( <i>Camelus bactrianus</i> ) ..	....	15	9	19
Llama ( <i>Lama peruana</i> ) .....	10	7	2	5
Reindeer ( <i>Rangifer tarandus</i> ) .....	5-6	*4	3	0
Indian Muntjac ( <i>Cervulus muntjac</i> )....	....	4	2	22
Fallow Deer ( <i>Cervus dama</i> ) .....	....	*15	6	14
		*11	6	6
		*11	5	28
		*8	6	24
		*6	5	3
		14	10	10
		13	0	0
		11	8	15
Red Deer ( <i>Cervus elaphus</i> ) .....	12			

Names of the animals.	Duration of life.			
	Approximative.	Ascertained.		
	years.	years.	months.	days.
Wapiti Deer ( <i>Cervus canadensis</i> ).....	.....	10 *7 *5	8 5 6	0 2 24
Sambur Deer ( <i>Cervus aristotelis</i> ) ....	.....	17	1	25
Hog Dear ( <i>Cervus porcinus</i> ) .....	10-11	7 *5	3 8	7 12
Axis Deer ( <i>Cervus axis</i> ) .....	.....	10	0	1
Alpine Chamois ( <i>Rupicapra tragus</i> ) ..	7	9	7	29
Bubaline Antelope ( <i>Alcelaphus bubalis</i> ) ....	.....	16 *12	8 10	29 0
Duyker-bock ( <i>Cephalophus mergens</i> ) ..	.....	2 7	6 5	24 5
Dama Gazelle ( <i>Gazella dama</i> ).....	.....	3	4	8
Gazelle ( <i>Gazella dorcas</i> ) .....	5			
Leucoryx ( <i>Oryx leucoryx</i> ) .....	.....	16	8	14
Nylghaie ( <i>Boselaphus pictus</i> ) .....	.....	8 12	0 2	11 24
Eland ( <i>Oreas canna</i> ) .....	.....	15 *11	0 2	4 10
Antilope redunca .....	.....	8	4	3
Mouflon ( <i>Ovis musimon</i> ) .....	.....	*12 *9 *7 *6 13	9 8 8 8 9	3 21 1 3 19
<i>Ovis strepsiceros</i> .....	.....	*7 *5 10 11	9 8 4 10	11 15 24 16

Names of the animals.	Duration of life.			
	Approximative.	Ascertained.		
	years.	years.	months.	days
<i>Ovis campestris</i> .....	....	*13	8	10
		*9	9	0
		*9	8	20
		*6	9	10
African Domestic Sheep ( <i>Ovis aries</i> ) ..	....	13	3	2
American Bison ( <i>Bison americanus</i> ) ..	....	9	6	5
		8	8	19
		*6	9	27
Yak ( <i>Poephagus grunniens</i> ) .....	....	14	9	12
		15	3	8
		12	8	24
AVES.				
ACCIPITRES.				
Common Buzzard ( <i>Buteo vulgaris</i> ) ....	....	3	5	28
Bateleur Eagle ( <i>Helotarsus ecaudatus</i> )	7			
White-headed Sea-Eagle ( <i>Haliaetus leucocephalus</i> ).	....	13	7	11
Golden Eagle ( <i>Aquila chrysaetos</i> ) ....	....	13	11	21
		10	2	0
Common Kestrel ( <i>Tinnunculus alaudarius</i> ).	....	6	7	4
Cinereous Vulture ( <i>Vultur monachus</i> ) ..	....	*15	4	22
Sociable Vulture ( <i>Vultur auricularis</i> ) ..	....	*17	4	4
Griffon Vulture ( <i>Gyps fulvus</i> ) .....	....	14	9	28
		*17	4	6
Black Vulture ( <i>Cathartes atratus</i> ) ....	....	*19	3	23
Condor Vulture ( <i>Sarcorhamphus gryphus</i> ).	....	20	0	24

Names of the animals.	Duration of life.			
	Approximate.	Ascertained.		
		years.	years.	months.
STRIGES.				
Wood-Owl ( <i>Syrnium aluco</i> ).....	....	13 9	2 11	19 2
Great Eagle-Owl ( <i>Bubo maximus</i> ) ....	12			
Virginian Eagle-Owl ( <i>Bubo virginianus</i> ) ....	....	16	2	18
Naked-footed Owlet ( <i>Athene noctua</i> )..	....	6	8	13
PSITTACI.				
Rose-crested Cockatoo ( <i>Cacatua moluccensis</i> ).	....	*20 *10 18	5 2 0	16 28 18
Greater White-crested Cockatoo ( <i>Cacatua cristata</i> ).	....	*9	9	6
Greater Sulphur-crested Cockatoo ( <i>Cacatua galerita</i> ).	....	*17 *15 *9	9 2 6	4 26 28
Leadbeater's Cockatoo ( <i>Cacatua leadbeateri</i> ).	....	*17	9	23
Slender-billed Cockatoo ( <i>Licmetis tenuirostris</i> ).	....	*17	8	13
Ganga Cockatoo ( <i>Callocephalon galeatum</i> ).	....	9	10	0
Great Black Cockatoo ( <i>Microglossa aterrima</i> ).	....	2	7	14
Alexandrine Parrakeet ( <i>Palæornis alexandri</i> ).	....	13	2	0
Ring-necked Parrakeet ( <i>Palæornis torquatus</i> ).	....	16 *17	6 6	23 21

Names of the animals.	Duration of life.			
	Approximate.	Ascertained.		
		years.	months.	days.
<i>Palæornis pondicerianus</i> . . . . .	....	4	10	15
Müller's Parrakeet ( <i>Tanygnathus mel- leri</i> ).	10			
Pennant's Broadtail ( <i>Platycercus pen- nanti</i> ).	4	3	1	1
Rose-Hill Broadtail ( <i>Platycercus eri- mius</i> ).	....	2 3	10 1	7 20
Pale-headed Broadtail ( <i>Platycercus pal- lidiceps</i> ).	....	3	7	10
Bauer's Broadtail ( <i>Platycercus zonarius</i> )	....	3 10	8 5	10 13
Beautiful Parrakeet ( <i>Psephotus pul- cherrimus</i> ).	....	8	5	0
Grey-headed Love-bird ( <i>Psittacula cana</i> ).	....	8	10	0
Red-and-blue Macaw ( <i>Ara macao</i> ) ....	....	*21 *14	6 7	0 0
Red-and-yellow Macaw ( <i>Ara chloro- ptera</i> ).	....	*17	5	9
Blue-and-yellow Macaw ( <i>Ara ararauna</i> )	....	*20	3	13
Illiger's Macaw ( <i>Ara maracana</i> ). . . . .	....	14	11	23
Carolina Conure ( <i>Conurus carolinensis</i> )	....	*10 12	5 3	23 14
Mexican Conure ( <i>Conurus holochlorus</i> )	....	3	10	17
Golden Conure ( <i>Conurus luteus</i> ). . . . .	....	9	11	17
Grey-breasted Parrakeet ( <i>Bolborhyn- chus monachus</i> ).	7	5	4	22

Names of the animals.	Duration of life.			
	Approximate.	Ascertained.		
		years.	months.	days.
White-fronted Amazon ( <i>Chrysotis leucocephala</i> ).	years. ....	*5	5	19
Red-fronted Amazon ( <i>Chrysotis vittata</i> )	....	8	7	21
PASSERES.				
Song-Thrush ( <i>Turdus musicus</i> ) .....	....	12	8	29
Fieldfare ( <i>Turdus pilaris</i> ) .....	....	*5	3	0
Rock-Thrush ( <i>Monticola saxatilis</i> )....	....	*6	2	8
Common Bluebird ( <i>Sialia wilsoni</i> ) ....	....	*3	6	8
Yellow-bellied Liothrix ( <i>Liothrix luteus</i> ).	....	*3	8	10
<i>Crithagra brasiliensis</i> .....	7-8			
Red-shouldered Starling ( <i>Agelæus phæniceus</i> ).	....	5	3	10
Green Glossy Starling ( <i>Lamprocolius chalybeus</i> ).	....	7	9	23
Long-tailed Glossy Starling ( <i>Lampro- tornis æneus</i> ).	....	1 5	9 8	4 5
Common Mynah ( <i>Acridotheres tristis</i> )	....	*5	5	19
Black Troupial ( <i>Quiscalus lugubris</i> ) ..	....	*4	7	12
Common Starling ( <i>Sturnus vulgaris</i> ) ..	....	*9 *7 *6	5 7 3	12 5 4
Sardinian Starling ( <i>Sturnus unicolor</i> )..	....	9	7	3
Rose-coloured Pastor ( <i>Pastor roseus</i> ) ..	....	2 *2	7 6	8 7



Names of the animals.	Duration of life.			
	Approximate.	Ascertained.		
	years.	years.	months.	days
Raven ( <i>Corvus corax</i> ) . . . . .	....	7	10	24
Common Jay ( <i>Garrulus glandarius</i> ) ..	....	*4 5	6 11	23 0
Blue-bearded Magpie ( <i>Cyanocorax cyanopogon</i> ).	....	*3 4	4 2	0 25
Blue Jay ( <i>Cyanocitta cristata</i> ) . . . . .	....	4 8 6	9 2 7	0 22 19
Wandering Tree-Pie ( <i>Dendrocitta vagabunda</i> ).	....	2	4	27
Chinese Tree-Pie ( <i>Dendrocitta sinensis</i> )	....	*3	4	25
Alpine Chough ( <i>Pyrrhocorax alpinus</i> )	....	*6 3	9 6	8 5
White-backed Piping Crow ( <i>Gymnorhina leuconota</i> ).	....	*4	8	6
Black-and-yellow Tanager ( <i>Euphonia chlorotica</i> ).	....	*2	3	15
Archbishop Tanager ( <i>Tanagra ornata</i> )	....	*2	0	27
Brazilian Tanager ( <i>Ramphocælus brasilius</i> ).	....	*2 *2 *2	4 7 2	7 15 16
Red Tanager ( <i>Pyranga rubra</i> ) . . . . .	....	*3 3	6 4	8 4
Black-headed Finch ( <i>Munia malacca</i> )	10			
Shining Weaverbird ( <i>Hypocheranitens</i> ).	5			
Red-faced Weaverbird ( <i>Foudia erythrops</i> ).	....	9	0	27

Names of the animals.	Duration of life.			
	Approximate.	Ascertained.		
		years.	months.	days.
Red-beaked Weaverbird ( <i>Quelea sanguinrostris</i> ).	5			
Masked Weaverbird ( <i>Hyphantornis personata</i> ).	....	8 8 9	0 3 0	4 14 10
Black-bellied Weaverbird ( <i>Euplectes afer</i> )	6			
Red-headed Cardinal ( <i>Paroaria dominicana</i> ).	....	*14 13	8 0	0 9
Red-crested Cardinal ( <i>Paroaria cucullata</i> ).	....	*2	3	20
Black-crested Cardinal ( <i>Gubernatrix cristatella</i> ).	....	10 8	2 2	5 0
Cardinal Grosbeak ( <i>Cardinalis virginianus</i> ).	....	2 *3 *4	5 8 0	1 0 13
Laughing Kingfisher ( <i>Dacelo gigantea</i> ).	....	6 9 *4	2 10 8	17 17 6
Red-billed Hornbill ( <i>Toccus erythrorhynchus</i> ).	....	*7	8	24
Ground-Hornbill ( <i>Bucorvus abyssinicus</i> )	....	*5	6	24
Violaceous Plain-tail-cutter ( <i>Musophaga violacea</i> ).	....	1	0	14
Buffon's Touracou ( <i>Corythaix buffoni</i> )	2			
Senegal Touracou ( <i>Corythaix persa</i> ) ..	....	1 *3 2	5 4 8	28 25 7
Ariel Toucan ( <i>Ramphastos ariel</i> ) ....	....	5 2	2 8	18 11

Names of the animals.	Duration of life.			
	Approximative.	Ascertained.		
	years.	years.	months.	days.
Green-billed Toucan ( <i>Ramphastos di-colorus</i> ).	....	11 13	2 10	3 21
<i>Ramphastos piscivorus</i> .....	....	3	2	25
Banded Aracari ( <i>Pteroglossus torquatus</i> )	....	2	10	24
COLUMBÆ.				
White-crowned Pigeon ( <i>Columba leucocephala</i> ).	2			
Passenger Pigeon ( <i>Ectopistes migratorius</i> ).	....	3 *6	3 6	25 19
Carolina Dove ( <i>Zenaidura carolinensis</i> )	....	5	3	7
Barred Dove ( <i>Geopelia striata</i> ) .....	....	4 4	1 2	13 20
Passerine Ground-Dove ( <i>Chamæpelias passerina</i> ).	9			
Talpacoti Ground-Dove ( <i>Chamæpelias talpacoti</i> ).	....	7	8	11
Bronze-winged Pigeon ( <i>Phaps chalcoptera</i> ).	....	15	3	25
Blue-headed Pigeon ( <i>Sturnænas cyanocephala</i> ).	....	2	0	5
GALLINÆ.				
Pallas's Sand-Grouse ( <i>Syrnhaptas paradoxus</i> ).	....	2 3	3 4	21 17
Black Grouse ( <i>Tetrao tetrix</i> ) .....	....	*3 *2	6 3	0 4
Capercaillie ( <i>Tetrao urogallus</i> ) .....	....	1 *2	9 8	5 9

Names of the animals.	Duration of life.			
	Approximate.	Ascertained.		
		years.	months.	days.
Common Quail ( <i>Coturnix communis</i> ) ..	years. 5			
Sonnerat's Jungle-Fowl ( <i>Gallus sonnerati</i> ).	....	4	3	21
Globose Curassow ( <i>Crax globicera</i> ) ..	....	*5	8	5
Razor-billed Curassow ( <i>Mitua tuberosa</i> ).	....	5 7	4 6	17 11
Brush-Turkey ( <i>Talegalla lathamii</i> )....	....	*6 7	10 3	8 18
STRUTHIONES.				
Ostrich ( <i>Struthio camelus</i> ) .....	...	7 2	8 9	6 9
Common Rhea ( <i>Rhea americana</i> ) ....	....	4 7 4 4	11 8 10 5	14 5 14 26
Common Cassowary ( <i>Casuarius galeatus</i> ) ....	....	6	6	0
Emu ( <i>Dromæus novæ hollandiæ</i> ) ....	....	15 16 7 *8	1 5 10 7	0 6 12 14
GRALLÆ.				
Hyacinthine Porphyrio ( <i>Porphyrio cæruleus</i> ).	....	*4	1	27
Grey-headed Porphyrio ( <i>Porphyrio poliocephalus</i> ).	....	*4	1	24
Sarus Crane ( <i>Grus antigone</i> ) .....	....	*5	9	9
White American Crane ( <i>Grus americana</i> ) ....	....	*8	8	3
Demoiselle Crane ( <i>Anthropoides virgo</i> ) ....	....	13	2	25

Names of the animals.	Duration of life.			
	Approximative.	Ascertained.		
		years.	months.	days.
Balearic Crowned Crane ( <i>Balearica pavonina</i> ).	14			
Cape Crowned Crane ( <i>Balearica regulorum</i> ).	....	*5	3	14
Oyster-catcher ( <i>Hæmatopus ostralegus</i> ).	....	*5	5	9
		*5	3	18
Black-tailed Godwit ( <i>Limosa melanura</i> )	5			
Ruff ( <i>Machetes pugnax</i> ) .....	5			
European Avocet ( <i>Recurvirostra avocetta</i> ).	3			
Little Egret ( <i>Ardea garzetta</i> ) .....	....	*6	9	23
		*4	2	13
		6	1	29
		3	5	16
Black Stork ( <i>Ciconia nigra</i> ) .....	....	*4	5	6
White Stork ( <i>Ciconia alba</i> ) .....	....	*6	5	10
		*3	8	20
Marabou Stork ( <i>Leptoptilus crumeniferus</i> ).	....	*12	4	3
Saddle-billed Stork ( <i>Xenorhynchus senegalensis</i> ).	....	3	4	10
Common Spoonbill ( <i>Platalea leucorodia</i> ).	....	*5	4	26
		*2	6	13
Sacred Ibis ( <i>Ibis æthiopica</i> ) .....	....	3	6	16
Scarlet Ibis ( <i>Eudocimus ruber</i> ) .....	....	3	2	25
		*10	5	14
NATATOIRES.				
Spur-winged Goose ( <i>Plectropterus gambensis</i> ).	....	8	9	10
		9	8	26
		9	9	11

Names of the animals.	Duration of life.			
	Approximative.	Ascertained.		
		years.	months.	days.
Egyptian Goose ( <i>Chenalopex aegyptiaca</i> ).	....	16	6	12
		16	8	17
		17	0	0
		11	4	0
Cereopsis Goose ( <i>Cereopsis novæ hollandiæ</i> ).	....	2	9	7
		2	9	12
		2	10	4
		*3	7	4
Pink-footed Goose ( <i>Anser brachyrhynchus</i> ).	....	*15	9	4
Bean-Goose ( <i>Anser segetum</i> ) .....	....	*19	0	16
		*18	11	6
Little Goose ( <i>Anser erythropus</i> ).....	18			
Bernicle Goose ( <i>Bernicla leucopsis</i> ) ..	12	*5	4	22
Canada Goose ( <i>Bernicla canadensis</i> ..	10	*5	1	6
Brant Goose ( <i>Bernicla brenta</i> ) .....	....	*7	8	19
		*5	11	16
Common Swan ( <i>Cygnus olor</i> ) .....	....	*15	7	11
		10	1	2
Black Swan ( <i>Cygnus atratus</i> ).....	....	15	9	25
		8	6	19
		*6	7	6
		*5	3	15
Common Sheldrake ( <i>Tadorna vulpanser</i> ).	....	*6	6	9
		*5	4	11
Ruddy Sheldrake ( <i>Tadorna rutila</i> )....	....	*6	10	8
		*6	7	13
Common Teal ( <i>Querquedula crecca</i> ) ..	....	*5	10	20
Garganey Teal ( <i>Querquedula circia</i> ) ..	....	*5	11	5

Names of the animals.	Duration of life.			
	Approximate.	Ascertained.		
		years.	months.	days.
Common Pintail ( <i>Dafila acuta</i> ) . . . . .	....	*17 *16	6 8	9 15
Bahama Duck ( <i>Dafila bahamensis</i> ) . . . .	5			
Wigeon ( <i>Mareca penelope</i> ) . . . . .	....	*19 *18 *12	11 7 7	6 0 25
Summer Duck ( <i>Aix sponsa</i> ) . . . . .	....	3 *3	9 7	20 8
Tufted Duck ( <i>Fuligula cristata</i> ) . . . . .	....	*18 *17	7 8	0 0
Red-headed Pochard ( <i>Fuligula ferina</i> ) . . . .	....	*12 *5	6 10	2 12
Common Cormorant ( <i>Phalacrocorax carbo</i> ). . . .	....	12 *6	6 4	14 16
White Pelican ( <i>Pelecanus onocrotalus</i> ) . . . .	....	16	6	6
Crested Pelican ( <i>Pelecanus crispus</i> ) . . . .	....	5	8	27
Herring-Gull ( <i>Larus argentatus</i> ) . . . .	....	*11	7	13
Common Gull ( <i>Larus canus</i> ) . . . . .	....	13 *5	6 11	25 7
Greater Black-backed Gull ( <i>Larus marinus</i> ). . . .	....	*21	3	15
Black-headed Gull ( <i>Larus ridibundus</i> ) . . . .	17			

The 31st of December last has been taken as latest date for the following calculation of the average lifetime of the animals in our zoological garden. As the duration of life could be determined with certainty for by far the greater part of the specimens, we simply disregarded such as were entirely unsuited for calculation. Referring to these latter, it should be mentioned that the difference between the entire number of Rodentia and the number of specimens of the same

order the lifetime of which is ascertained follows for the impossibility of giving definite dates for the duration of life of Rabbits, Guinea-pigs, and some other small species of the same kind.

Sheep and Goats cause the differences between the numbers respecting Ruminantia.

We were also obliged to leave out of consideration several sorts of Parrots—namely, *Nymphicus*, *Bolborhynchus*, and others. Of Fowls and Pigeons only the wild species have been selected for the register.

The results are as follows:—

205 Mammals: total of age, 829 years 11 months 27 days; mean duration of life per head, 3 years 9 months 26 days.

784 Birds: total of age, 3549 years — months 7 days; mean duration per head, 4 years 4 months 23 days. Together, 989 animals, 4379 years — months 4 days; mean duration of life per head, 4 years 5 months 6 days.

The mean duration of life of the animals which died in the year 1879 is 2 years 4 months 27 days. This, so much shorter time than that mentioned before, will be easily explained by the fact that the mortality is much greater in the first days after the arrival of animals in a zoological garden.

I am certain that similar statistics would give very useful hints to persons interested in such matters; and I wish that this branch of knowledge were cultivated more specially than it has been heretofore.

*Specification of Average Lifetime.*

	Number of animals at hand Jan. 1, 1880.	Number of animals the age of which is ascertained.	Total of age.			Mean age of individuals.		
			yrs.	mths.	days	yrs.	mths.	days
MAMMALIA.								
Quadrumanæ.....	36	36	88	0	22	2	5	12
Chiroptera.....	1	1	0	2	29	0	2	29
Carnivora.....	42	42	154	7	23	3	8	8
Rodentia.....	60	8	24	10	1	3	1	7
Marsupialia.....	6	6	19	6	16	3	3	3
Equidæ.....	10	10	88	8	2	8	10	16
Pachydermata.....	7	7	31	2	23	4	5	18
Ruminantia.....	103	95	418	9	1	4	4	28
AVES.								
Accipitres.....	33	33	149	1	26	4	6	9
Striges.....	5	5	8	4	16	1	8	6
Psittaci.....	108	54	347	7	23	6	5	6
Passeres.....	260	233	492	4	10	2	1	11
Columbæ.....	86	17	47	9	17	2	9	26
Gallinæ.....	83	22	49	0	18	2	2	23
Struthionæ.....	1	1	8	7	14	8	7	14
Grallæ.....	84	64	328	0	5	5	1	15
Natatores.....	389	355	2121	11	28	5	11	26



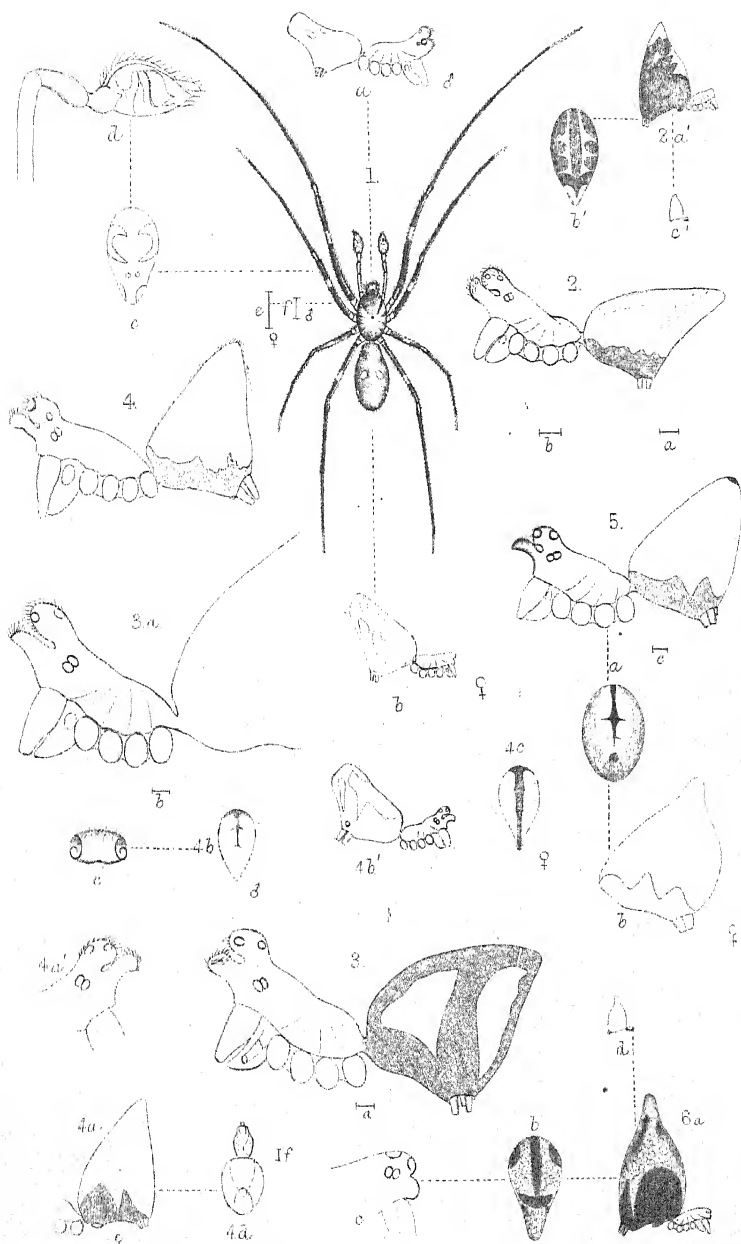
3. On some new and little-known Spiders of the Genus *Argyrodes*, Sim. By the Rev. O. P. CAMBRIDGE, M.A., C.M.Z.S., &c.

[Received April 1, 1880.]

(Plates XXVIII.—XXX.)

The Spiders described in the present paper have been received at various times during the last few years from widely distant exotic regions—South America, East Indies, Ceylon, South Africa, Madagascar, Samoa Island, and Amboina; and I now beg leave to record my thanks to those kind friends who have either collected them for me or sent them to me, viz. Mr. Frederick Bond, Major Julian Hobson (H.M.S. Staff Corps, Bombay), Professor Traill (Univ. Aberdeen), Mr. G. H. K. Thwaites (Botanic Gardens, Ceylon), Mr. Henry Rogers (of Freshwater, Isle of Wight), the Rev. J. Whitmee (of the Samoa Islands), Mr. H. H. B. Bradley (of Sydney, N.S.W.), Capt. F. W. Hutton (of New Zealand), Mr. J. P. Mansel Weale (of South Africa), and Mr. R. H. Meade (of Bradford, Yorkshire).

Few Spiders are equal to those of the genus *Argyrodes* (and none exceed them) in the brilliancy of their hues. Some of them look like drops of burnished silver suspended in their snares; and one of those here recorded, *Argyrodes scintillulana* (p. 332), resembles a bit of jet studded with diamonds. Their structure also is of a very marked and distinctive kind. The abdomen is subject to a greater or less abnormal development of the posterior extremity, but varying in the two sexes; and the caput (in the male sex) is almost invariably developed into a form which makes some of them resemble very closely some species of the genus *Walckenaëra* (Bl.). The fore extremity of the caput is produced and split into two lobes or segments by a more or less deep transverse indentation or cleft. There is, however, a very marked and constant difference between these two genera in respect of the position of the eyes. In *Argyrodes* no eyes are ever found on the lower segment of the caput, while in *Walckenaëra* the eyes of the fore-central pair are always placed either in front of it or at its extremity. Another very obvious characteristic of *Argyrodes* is the great length and slenderness of the first two pairs of legs, though in this respect, as well as in the development of the abdomen, *Argyrodes* is far surpassed by the Spiders of an allied and, in some respects, still more curious genus, *Ariamnes*, Thor. (*Ariadne*, Dol.). The adult females of some (perhaps all) species of *Argyrodes* are subject to the apparently adventitious addition to their genital process of a bright, transparent, reddish, resinous-looking accretion. This often gives an abnormal appearance to the genital aperture; and it has been mistaken by Mr. Blackwall for part of the process itself (*vide* description of *Epeira cognata*, Bl., Proc. R. Irish Acad. 1877, 2nd ser. vol. iii. pp. 17, 18). I feel, however, quite convinced that

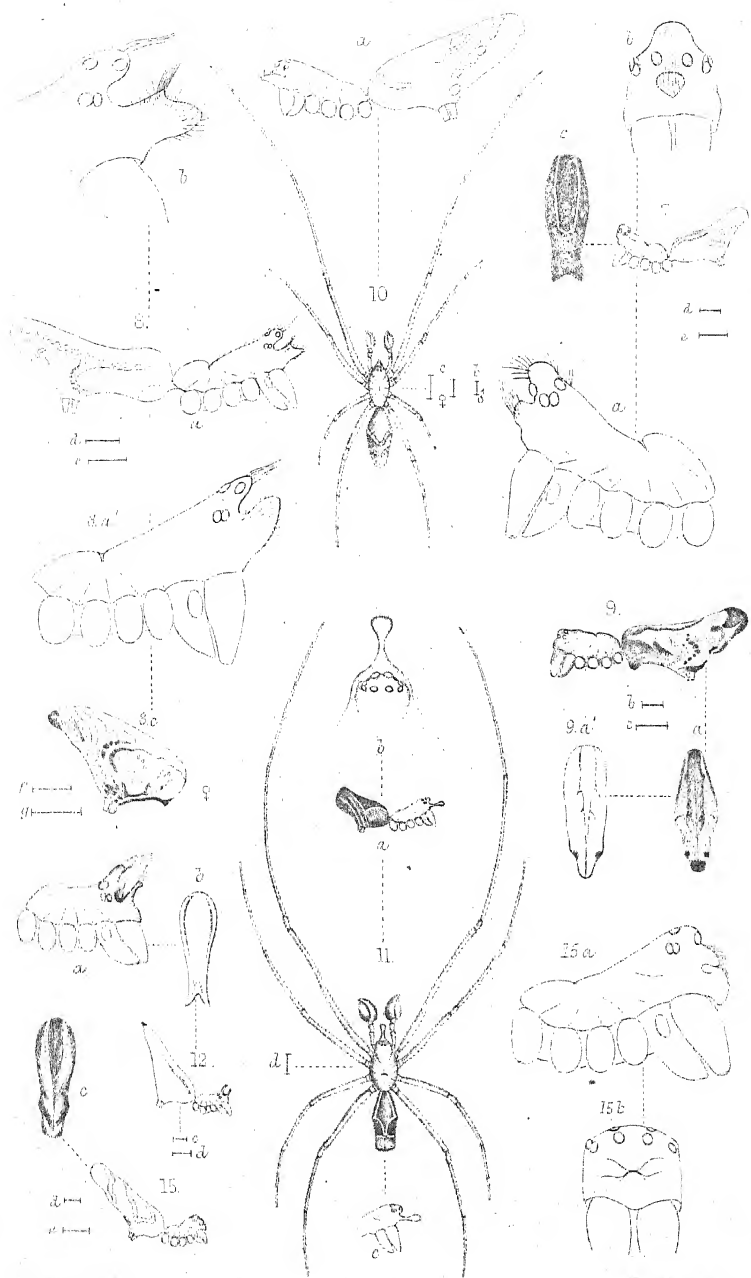


O.P. Cambridge del.  
E. Carter lith.

Winter's Bies imp.

Spiders of the genus *Argyrodes*.





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Winter Bros. and

Species of the genus *Arévrodes*







this accretion forms no part (properly speaking) of the genital process, though in what way it is formed it is difficult to say; probably it is an exudation from the genital organs, which hardens on coming into contact with the air, and so adheres to the process in its outward passage. I have noticed it in several species; but it is by no means invariably found in all the individuals of a species. This abnormal development greatly obscures its real structure, and considerably lessens the value of the genital process of *Argyrodes* as a criterion (so valuable in general) of specific distinctness.

Little appears to be known yet of the habits of this curious group of Spiders. So far as observations have been made, they live in their own irregular snares, spun among the outskirts of the snares of large Epeirids. When travelling in Palestine some years ago, I met with the type of the genus (*Argyrodes epeiræ*, Sim.) in abundance near the Sea of Tiberias, in the outskirts of the webs of *Cyrtophora opuntia*, Duf.; its pretty little pear-shaped egg-cocoons were also found suspended in the same position. Out of numerous cocoons brought home, almost all were infested by a minute hymenopterous parasite, the perfect forms of which emerged at different times during the following summer. There does not appear to be any great variety in the form of the egg-cocoon of the different species, those of several which I have received being very nearly alike, excepting in size.

The known species of *Argyrodes* are now becoming rather numerous—about 29 species, in addition to the 21 new ones here described, having been already characterized; probably many more will be discovered when greater attention is given to them by collectors in exotic regions. Several of the most curious of those now described were found among débris of the snares of some large Epeirids, having evidently been bottled along with the latter but not specially noticed or recognized at the time by the collectors.

#### Fam. THERIDIIDES.

#### Genus ARGYRODES, Sim.

#### ARGYRODES FLAVESCENS, sp. n. (Plate XXVIII. fig. 1.)

Adult male, length rather more than  $1\frac{1}{2}$  line, that of the female being rather over  $2\frac{1}{2}$  lines.

The fore part of the caput of the male is produced and elevated, and is divided by a transverse cleft into two lobes, of which the upper one is the strongest. The colour of the cephalothorax, as well as of the palpi, falces, maxillæ, labium, and sternum, is yellow, tinged with orange; the anterior portion of the lobes into which the caput is produced is clothed with short coarse hairs.

The eyes are placed four on the summit of the upper lobe of the caput, forming nearly a square; and on each side, at a considerable distance below, a little behind the cleft which divides the two lobes, is another pair, the eyes of which are contiguous to each other.

The legs are long, slender, 1, 2, 4, 3, those of the first pair being much the longest. They are of a deep blackish-brown hue, with the



two basal joints and the hinder extremity of the femora yellow, each one of the femora having a single annulus of the same colour. The tarsi are of a pale hue; and all the legs are furnished with short fine hairs.

The *palpi* are moderately long; the cubital joint is strong, somewhat clavate, and double the length of the radial, which is of a blunt-pointed form, and adheres closely to the base of the palpal organs; the digital joints are large, of an oval form, with their convex sides directed towards each other; the palpal organs are compact, and not very complex.

The *fulcres* are long, not very strong, but projecting forwards.

The form of the *maxilla*, *labium*, and *sternum* is normal.

The *abdomen* has its hinder extremity considerably produced into a large somewhat cylindrical prominence, rounded at its extremity; it is of a dull clay-yellow hue, with a black spot at the end of the prominent portion, and another stronger one just above the spinners, which are placed about halfway between the fore and hinder extremity of the abdomen. Near the middle of the upperside are two silvery-white spots in a transverse line, and two others behind them, wider apart, one on each side of the produced portion.

The female resembles the male in general colours and markings; but the legs are shorter, the cephalothorax wants the elevated bilobed anterior part of the caput, and the abdomen is of a different shape, being gradually elevated to a great height, and forming, when looked at in profile, a nearly isosceles triangle whose base is much shorter than its sides. The silvery markings also on the abdomen are larger and more numerous, varying, however, a little in their size and form, that represented in figure 1c showing their greatest extent.

This pretty Spider is quasiparasitic, living in the webs of some Epeirid, though I do not know of what species. It appears to be an abundant species, numerous examples of both sexes having been sent to me at different times from Ceylon by Mr. G. H. K. Thwaites.

*ARGYRODES CONCINNA*, sp. n. (Plate XXVIII. fig. 2.)

Adult male, length to the spinners  $1\frac{1}{2}$  line, and to the apex of the abdomen 2 lines.

This species is allied to *Argyrodes epeiræ*, Sim., but easily distinguishable by the form of the caput, and also by the form and pattern of the abdomen.

The inferior lobe of the fore part of the caput is almost as strong as the superior one; its extremity is rather upturned; and the cleft between the two is nearly obsolete, as, excepting at the base of the cleft, the two lobes are in contact with each other.

The cephalothorax, legs, and palpi are yellow-brown.

The *legs* are long and slender, 1, 2, 4, 3; those of the first pair exceed three times the length of the Spider itself; and the anterior part of the tibiae and femora of this pair is strongly suffused with dark reddish brown; their armature consists of fine hairs only.

The *palpi* are very similar to those of *A. epeiræ*; but the structure of the palpal organ differs a little.

The *abdomen* has its upperside drawn out or elevated into a long tapering or conical form, and very slightly curved, the apex being subacute. It is of a yellow-brownish hue, the underside suffused with black-brown; a dark, central, blackish stripe tapering to a line occupies the upperside, and ends in a short transverse spot or blotch close to the apex; on each side of this central stripe is a more or less broad and tolerably even-edged, silvery longitudinal band; and in some examples there are irregular traces of silvery markings on the sides of the abdomen.

It is probable that the darker portions of the abdomen will be found in well-preserved examples to be of a deeper hue than that here mentioned, all the examples I have examined having a somewhat faded appearance in the abdomen.

Examples of this very distinct species were contained in Professor Traill's Amazons collection.

It is possible that this may be the male of *Argyrodes lugens*, Cambr., inasmuch as all the examples of that Spider were *females*, and all of the present are *males*, and all were mixed together in the collection. There is, however, no such similarity of form, either in the abdomen or its pattern, as would lead one to conclude without great doubt that both belong to one species. I have therefore thought it best to describe them at present as distinct from each other, leaving it to future observations to decide whether they be identical or not.

ARGYRODES SAMOENSIS, sp. n. (Plate XXVIII. fig. 3.)

Adult male, length  $\frac{1}{2}$  of an inch; female rather larger.

This Spider is also nearly allied to *Argyrodes epeiræ*, Sim., but is quite distinct from it, differing both in the pattern on the abdomen and in the form of the caput.

In the present Spider the two lobes of the caput are equally robust, and are shorter than in *A. epeiræ*; the extremity of the anterior lobe is rather enlarged and very obtuse, clothed (as in other species) with hairs directed backwards and meeting those directed forwards from the posterior lobe over the cleft between the two; the cleft in the present species is broader, but less deep, than in *A. epeiræ*. A comparison, however, of fig. 3 (Plate XXVIII.) with the figure given of *A. epeiræ* (fig. 3 a, Plate XXVIII.) will show at once these structural differences between the two species.

The colour of the cephalothorax and legs is yellow-brown; and the palpi are similar, excepting that the digital joints are of a deep reddish black-brown hue.

In respect of the palpi and palpal organs there is a strong similarity to *A. epeiræ* and others, though the structures of the palpal organs, when examined carefully, show some differences.

The *legs* (relative length 1, 2, 4, 3)—first two pairs long and slender, but not excessively so, and clothed with fine hairs only.

The *fulcres*, similar in colour to the cephalothorax, are rather shorter than those of *A. epeiræ*.

The *abdomen* is less elevated than in that species, and the profile-line of the upperside is more strongly and regularly curved. It

may be described as of a deep rich black-brown colour, marked with four very large somewhat triangular patches of a bright silvery hue ; or, in those examples where the silvery areas preponderate, these areas may be taken as the ground-colour on which are very plainly and distinctly marked a broad, even-edged, longitudinal, deep-black-brown central band from the fore extremity of the upperside to the apex, another less broad from the apex to the spinners, and a third as nearly as possible bisects each side, running from the spinners into the band on the upperside ; all these bands merge in the general black-brown hue of the underside of the abdomen. In front of the spinners (on the underside) are the two usual silvery spots in a transverse line. It is probable that a series of examples would show some slight imperfection in the continuity of these abdominal bands, though from the three examples examined (one male and two females) I should expect to find the abdominal pattern above described a tolerably constant and strong specific character. From the above three examples there does not appear to be very much, if any, difference in colours or pattern between the two sexes.

A male and two females of this Spider were received several years ago from the Rev. J. Whitmee, by whom they were found in the Samoa Islands.

**ARGYRODES NEPHILÆ.** (Plate XXVIII. figs. 4, 4 a, 4 b, e, 4 c, 4 d, 4 f.)

*Argyrodes nephilæ*, Tacz. Hor. Soc. Ent. Ross. ix. p. 51.

Adult male, length  $\frac{1}{4}$  of an inch ; female rather larger.

The cephalothorax of this brilliant little Spider is of a dark blackish brown ; that of the female is of ordinary form ; but that of the male has the caput considerably elevated and produced forwards, where it is divided into two lobes by a deep transverse cleft or fissure ; the inferior lobe is much the smallest. The exact form of this part of the caput is represented as nearly as possible in fig. 4, Plate XXVIII. ; no lengthened description of this characteristic portion of structure would avail to distinguish it so accurately from other species nearly allied.

The eyes of the fore central pair are the largest of the eight, and are placed in a transverse line on each side, at the fore extremity of the caput ; behind these and lower down, at a little distance behind the base of the cleft, are the hind-central eyes, while at about the same distance lower down again, and almost in a line with the others on each side, are the lateral pairs, the eyes of each of which are contiguous to each other.

The *legs* are long, but not excessively so, slender, furnished with hairs only, of a dull yellowish hue ; the anterior portions of the femora and tibiæ (of those of the female at least) suffused with dark brown. In the only adult male I have seen, the legs were unicolorous.

The *abdomen* is short, but elevated into a very high conical form, its height being distinctly greater than its length ; in some examples the height is greater than in others, and the apex of the cone sharper. It is of a glistening silvery metallic hue ; from the middle of the anterior

extremity on the upperside it is bisected by a tapering black stripe, which ends at the apex of the cone; in the males this stripe is merely a short black line from which one or two vein-like branches issue obliquely on each side. The underside is black, or else black-brown deepening into black on each side; the margins of this black portion are well defined, dentated, and extend a little way up the sides. The dentation of the margins differs in the sexes, as will be seen from the figures given; in about a dozen examples of the female but very slight variation was apparent in the character of this dentation in that sex. On each side underneath, a little way in front of the spinners, are two round, shining, silvery spots in a transverse line.

The *palpi* of the male are in general appearance very like those of *A. epeira*, Sim., and others; the cubital joints are tumid and clavate, the radials short and spreading; the digitals are large, with a strong prominence or lobe towards their extremity on the inner side. The palpal organs are moderately complex; and at their fore extremity is a rather prominent process, whose termination is bifid or distinctly cleft.

An adult male and females of this Spider were contained in a collection of Spiders made in the Amazons of South America by Professor Traill, to whose kindness I am indebted for them. I have but little doubt that it is the Spider described by Prof. Taczanowski, *l. c. supra*.

In the form of the caput *Argyrodes nephilæ* is very similar to *A. rostrata*, Bl. (Seychelle Islands); the anterior lobe of this latter species, however, is stouter, and the eyes of the hind-central pair are nearer to the summit of the occiput (*vide* Plate XXVIII. fig. 4 *a'*). The abdomen also is of quite a different form—less elevated, very obtuse at the apex, and with a distinct pattern on the sides (fig. 4 *b'*), this part in *A. nephilæ* being immaculate.

ARGYRODES ARGENTATA, sp. n. (Plate XXVIII. fig. 5.)

Adult male, length  $\frac{1}{10}$  of an inch; female considerably larger.

This Spider is very closely allied to *Argyrodes nephilæ*, Tacz., resembling it in general form, colours, markings, and appearance. It is, however, considerably larger; the form of the caput differs in the more curved shape of its anterior segment, which is also rather longer in proportion to the posterior one; the hind central pair of eyes are also placed further up on the occipital part of the posterior segment, being thus considerably removed from a straight line with the lateral pair and fore-central eye on each side.

The abdomen also is less elevated, and its conical point more obtuse; it is of a similar brilliant silvery hue; its upper point slightly tipped with brown, and a slender longitudinal central black or deep-brown line on the upperside, sometimes enlarged in an angular form at one or two points, from each of which issues a short vein-like line. The central line or stripe seldom appears to reach the conical point of the abdomen, and does not differ in form or strength in the sexes.

The *legs* are long, but not excessively so; and their relative length is 1, 2, 4, 3; they are of a pale yellow colour, slightly tinged with

yellow-brown towards the fore extremity of the femora and tibiae, and also on the genual joints.

The *palpi* of the male are very similar in form and structure to those of *Argyrodes nephilæ*; but the structure of the palpal organs differs. They are similar to the legs in colour, the digital joints and palpal organs being of a dark yellow-brown hue.

The form of the *abdomen* in the female differs a little from that of the male (*vide* Plate XXVIII. figs. 5 *a*, 5 *b*); the underside in both sexes is of a deep brown or black-brown, with two strong, well-marked points or denticulations on the margin on each side; a little way also in front of the spinners are two round silvery spots, widely separated in a transverse line.

Adults of both sexes of this beautiful little Spider were received some years ago from the East Indies through the kindness of Mr. F. Bond. More recently I have received females from Ceylon (from Mr. G. H. K. Thwaites) and from Madagascar (through Mr. R. H. Meade, of Bradford). Three examples of the female were also contained in Prof. Traill's Amazons collection.

The genital aperture of the female is of a deep blackish colour, and is smaller than that of *A. nephilæ*. In almost every example it had an adventitious and more or less prominent process connected with it, of a bright transparent red hue, and apparently of a resinous nature; so that the real form of the vulva was not easy to be made out. This resinous process appears to be found in some other species also; and in one, *A. cognata*, Bl. (Seychelle Islands), it was taken by Mr. Blackwall to be a portion of the sexual process itself. It is, however, I think, certainly adventitious, and formed by an exudation, of the cause and nature of which we are ignorant.

#### ARGYRODES JUCUNDA, sp. n. (Plate XXVIII. fig. 6.)

Adult female, length to the spinners 2 lines, and from the spinners to the apex of abdomen  $2\frac{2}{3}$  lines.

This Spider is nearly allied to *Argyrodes nephilæ*, Tacz., and others. It is, however, larger; and the apex of the abdomen is more drawn out and pointed, the abdomen itself being more elevated and perpendicular; it is of a silvery hue, the silver spots being divided by a network of dull brown lines. On the upperside a broadish central longitudinal black-brown stripe runs from the fore extremity two thirds of the way towards the apex, ending in a broad transverse somewhat crescent-shaped black-brown band, beyond each end of which is an irregular patch of the same. The underpart is black, the black portion extending up the sides in a large somewhat circular form, with a somewhat tapering stripe running upwards on each side of the spinners.

The *cephalothorax* is of ordinary form, and of a deep brown colour, the clypeus rounded and prominent.

The *legs* are moderately long, slender, 1, 2, 4, 3, and clothed with fine hairs; they are of a yellow-brownish hue; the femora and fore extremities of the tibiae of the first and second pairs deep brown, and all the tarsi and metatarsi pale brownish yellow.

The *palpi* are short, of a blackish colour; and each terminates with a rather long, slender, slightly-curved claw.

A single example of this Spider, which is nearly allied to *Argyrodes antipodiana*, Cambr., was received from Parana, South America, where it was found some years ago by Mr. Henry Rogers.

ARGYRODES ANTIPODIANA, sp. n.

Adult female, length  $\frac{1}{6}$  of an inch.

This Spider is very nearly allied to *Argyrodes argentata*, Cambr., resembling it closely in general appearance, colours, and markings. In all the examples, however, that I have seen, the longitudinal black line on the upperside of the abdomen is stronger, and runs quite through to the apex of the hinder part; and in some examples there is a tendency to form one or more lateral oblique stripes running from the angular points of the upper margin of the underside towards the upperside; the apex of the abdomen is also more obtuse. In respect of the form of the abdomen, this species resembles *Argyrodes epeiræ*, Sim., very closely; and the variety of markings just now mentioned is also very like the less darkly marked varieties of that species; there is, however, in every one of the numerous females I have examined of *A. epeiræ*, a transverse dark bar or slender stripe on the upperside of the abdomen, a little way in front of the apex: and the central longitudinal stripe is always strong, but never runs through to the apex.

The genital aperture, although of the same general character, differs, though slightly, in all the three Spiders now compared; and I feel but little doubt that, when the male of *A. antipodiana* is discovered, it will be found that the form of the cephalothorax also differs in that sex from both the others mentioned. *A. epeiræ* is also apparently a larger Spider than the present one.

I have received examples of this Spider from Sydney, N. S. W. (from Mr. H. H. B. Bradley), and from New Zealand from Capt. F. W. Hutton.

ARGYRODES LUGENS, sp. n. (Plate XXVIII. figs. 2 a', b', c'.)

Adult female, length  $1\frac{1}{2}$  line.

This Spider is nearly allied to *Argyrodes epeiræ*, Sim; the abdomen, however, is higher and sharper at the apex, and its pattern is quite different. In one respect only there is a similar portion of the pattern—namely, in the constant presence of a transverse black bar on the upperside, a little way in front of the apex; this bar is generally broader than in *A. epeiræ*; and in regard to the colouring of the abdomen, the dark portions are nearly or quite jet-black, whereas in *A. epeiræ* they are more of a very deep red-brown hue.

The present Spider is very variable in respect of its pattern, varying from an almost uniform brilliant silvery hue, marked only with a central longitudinal black stripe on the upperside, terminating in the transverse bar above noticed, and a black underside boldly dentated on its upper margins, to a uniform jet-black ground marked on the upperside with two parallel longitudinal silver stripes or bands,

tridenticulate on their outer sides, and a lateral, elongate, somewhat triangular silvery patch near the upper part on each side, the apex of the abdomen also being of a silvery colour.

This variety is the one figured (Plate XXVIII. figs. 2 *a'*, *b'*), and is a very striking and beautiful one: in most varieties the two ordinary silver spots underneath, in a transverse line in front of the spinners, are visible; but none were apparent in the variety figured.

In this variety also the legs are nearly black, softening to a dark brown towards their extremities, the metatarsi being pale yellow-brown. Other varieties, in which the silvery hues of the abdomen prevail, have the legs of a more or less dark yellow-brown, the fore extremities of the tibiæ of the first pair being black-brown, and the tarsi and metatarsi light yellowish brown. The legs are slender, furnished with fine hairs only; their length is moderate, those of the first pair, as usual, considerably the longest, and those of the third pair very short—1, 2, 4, 3.

The colour of the cephalothorax appears to vary with the general colouring of the legs and abdomen, the lighter-coloured examples having a more or less dark yellow-brown cephalothorax, while that of the dark examples is a deep black-brown.

Examples of this species were contained in the collection of Spiders sent to me from the Amazons by Professor Traill.

*ARGYRODES ABSCISSA*, sp. n. (Plate XXIX. fig. 7.)

Adult male, length to the spinners  $1\frac{2}{3}$  line, and to the apex of the abdomen  $2\frac{1}{4}$ .

In the form of the fore part of the caput this Spider is not unlike *Argyroides epeiræ*, Sim., with the lower prominence or lobe cut off near its base. This lobe has therefore a truncated appearance, and is much shorter and less robust than the upper one; its extremity is furnished thickly with strong prominent hairs forming a tuft; those of the upper lobe are less numerous, and, as usual, directed forwards; this latter lobe forms a strong subconical eminence rounded at its apex and protruding upwards from between the four central eyes, its base occupying the whole of the quadrate area comprised within them.

Looked at in profile, the caput rises gradually from the thorax, and there is a slight dip or depression between the eyes of the hind central pair. The thorax is more than usually gibbous just behind the thoracic indentation.

The colour of the *cephalothorax* is dark yellowish brown.

The *legs* are dull brownish yellow, the genual joints and a small portion at the fore extremity of the tibiæ and metatarsi of those of the third and fourth pairs being of a darker hue, giving those legs a slightly annulate appearance; they are long and slender, but not inordinately so, and are furnished with short fine hairs only.

The *palpi* are rather long and strong. The radial and cubital joints are of about equal length; both are strong, the latter bent and clavate, the former broad and dilated at the anterior extremity. The digital joint is rather large, strongly bifid at its extremity, and

of a dark yellow-brown colour. The palpal organs are tolerably complex, but compact, and, like those of most others of the genus, devoid of any very remarkable process.

The *falces*, *maxillæ*, *labium*, and *sternum* are of normal form and structure, and similar in colour to the cephalothorax.

The *abdomen* has its hinder extremity produced in an oblong form, the apex being a little dilated but slightly bifid, becoming somewhat of a fish-tail form; the length from the fore extremity to the spinners is a little less than that from the spinners to the apex. The colour of the abdomen is brownish black, marked, mottled, and speckled with pale yellowish-white and silvery spots and markings. The most conspicuous of the latter form two longitudinal slightly curved lines or bars along the fore part of the upperside, enclosing an oblong or somewhat coffin-shaped black-brown marking; also on the hinder part of each side, a little above the spinners, is a somewhat V-shaped marking formed in a similar way.

Two adult males of this very distinct Spider were contained in the small Madagascar collection received from Mr. R. H. Meade several years ago.

ARGYRODES FISSIFRONS. (Plate XXIX. fig. 8 a'.)

*Argyroides fissifrons*, Cambr. Linn. Soc. Journ. Zool. x. p. 380, pl. xii. figs. 31-38; T. Thorell, Ann. Mus. Genov. xiii. p. 145 (1878).

*Argyroides inguinalis*, T. Thorell, l. c. p. 149.

This Spider is nearly allied to the next Spider described, *Argyroides procastinans* (Plate XXIX. fig. 9); but the latter is, I feel no doubt, a distinct species, the form and markings of the abdomen (fig. 9, a) being different from many examples of the female of *A. fissifrons* received from Ceylon. I have, however, considerable doubt whether *A. inguinalis*, Thor., is distinct from *A. fissifrons*. Dr. Thorell (l. c.) says that, excepting in the genital process, he can find no reliable difference between the two species (the female only of *A. inguinalis* being known to him). The genital process is in almost all Spiders a point of structure of the first importance for the distinction of species; but with respect to *Argyroides* I have not found it so reliable, as it is subject to great differences in external appearance, owing to the adventitious addition of the resinous-looking accretion mentioned above (p. 320). I am the more inclined to doubt the distinctness of Dr. Thorell's *A. inguinalis*, inasmuch as in an example he has kindly given me of it I observe traces of this accretion; and, excepting for this, there is no difference at all from my Ceylon examples of *A. fissifrons*. In one of the latter there is a similar disfigurement, which renders it quite undistinguishable from *A. inguinalis*.

Of the identity of Dr. Thorell's types (from Amboina) of *A. fissifrons*, and those I have received from Ceylon there is no doubt. The figure given (Plate XXIX. fig. 8 a') is from one of several examples kindly sent to me by Dr. Thorell. In the form of the apex of the abdomen the females differ considerably, some examples being drawn out into a much longer and more acute point than



others; but this part does not in any instance approach the form of that of *A. procrastinans*.

Both in Ceylon and Amboina *Argyrodes fissifrons* appears to be an abundant Spider.

ARGYRODES PROCRASTINANS, sp. n. (Plate XXIX. fig. 9.)

Adult female, length to the spinners  $1\frac{2}{3}$  line, and to the apex of the abdomen  $2\frac{1}{2}$  lines.

The *cephalothorax* of this Spider is of the ordinary form; the profile line lies pretty nearly level, though the occiput is a little gibbous and the thoracic indentation strong. Its colour is dull yellow-brown.

The *eyes* are in usual position. The four centrals form a square, round and near the base of a very slight rounded eminence. The clypeus exceeds in height half that of the facial space, and is a little prominent.

The *palpes*, *maxillæ*, *labium*, and *sternum* present no special characteristics, their colour being similar to that of the cephalothorax.

The *legs* are long and slender, 1, 4, 2, 3. They are of a pale yellowish hue, the genual joints and a small portion at the extremity of the femora and tibiæ of those of the three anterior pairs being of a yellow-brown colour; their armature consists of fine hairs only.

The *palpi* are short, slender, of a darker colour than the legs, and terminate with a curved and (so far as I could determine) unpectinated claw.

The *abdomen* is large, and considerably produced at its posterior extremity, which is bluff and rounded. On each side, near the middle, the abdomen is somewhat enlarged, though scarcely amounting to a prominence; but halfway between that and the hinder extremity is a rather distinct rounded prominence, giving a somewhat trituberculate appearance to the end of the abdomen, and reminding one strongly of a very similar form in some exotic species of *Cyclosa*. The colour of the abdomen is a somewhat pale golden with a metallic lustre. Along the middle of the upperside is a broad dark black-brown band, which becomes faint, interrupted at the middle, and almost obsolete a little past the lateral enlargement at the middle of the abdomen. The rounded apex of the abdomen is also black-brown; and the sides are encircled with a few spots, streaks, and patches of a similar hue. The spinners are placed on an eminence, the hinder half of which is black-brown and the fore part dull yellow-brown. The genital process is rather large, bluff, rounded and prominent, and of a bright shining red-brown colour, deepening to black in the middle; its anterior portion covers the aperture, and is of a hood-shape.

A single example of this Spider was contained in a collection kindly sent to me some years ago from Bombay by Major Julian Hobson, of the Bombay Staff Corps.

This species is nearly allied to *Argyrodes inguinalis* (Plate XXIX. fig. 9a'), Thor., a Spider found in Amboina, and included among the

synonyms of the foregoing species; but although the present Spider resembles *A. inguinalis* very nearly in colours, markings, and the general character of the abdominal form, it may be easily distinguished by the more obtuse and rounded form and black colour of the apex. In *A. inguinalis* the apex is indeed obtuse and rounded; but its tapering form is continued throughout, and its upper part and sides are completely silvery; the central longitudinal band also on the fore part of the upperside is paler, and tapers without interruption to a fine point. There is considerable similarity, but still a difference, in the form of the genital process in the two species.

From *A. fissifrons*, Camb., ♀, the present Spider may also be distinguished by the same characters as those which distinguish it from *A. inguinalis*, Thor.

ARGYRODES AMBOINENSIS. (Plate XXIX. fig. 8.)

*Argyrodes amboinensis*, Thor. Ann. Mus. Genov. xiii. p. 141 (1878).

The length of the adult male is  $2\frac{2}{3}$  lines to the spinners, and to the apex of the abdomen  $3\frac{1}{4}$ ; the length of the female, to the spinners rather over 3 lines, and to the extremity of the abdomen 4 lines.

This fine and beautiful species has been well described by Dr. T. Thorell (*l. c. supra*). I have, however, thought it worth while to include here one or two figures, and also a note upon the very distinctive characters of the caput. In the absence of figures it is almost impossible to determine many of the Spiders of this group, in which the peculiar structure of the caput assumes so many forms differing from each other often in minute but important particulars.

The fore part of the caput is divided into two lobes by a deep and wide cleft; the superior lobe is the smallest, and has the four central eyes on its upper side; the inferior lobe projects considerably beyond the superior one, its extremity is subconical, and about half-way between the extremity and the base of the cleft there is, on the upperside, a strong subangular point clothed with a tuft of black hairs; three strong sinuous bristles are directed forward from the fore extremity on the upperside of the superior lobe; there are, besides these, numerous bristly hairs on and about both the lobes.

As in most others of this group, the *abdomen* differs in form in the two sexes. That of the male is longer in proportion, and has its hinder extremity produced into a strong, somewhat cylindrical form, rounded at its apex; it is of a yellow-brown colour, ornamented with brilliant silvery markings edged in some parts with deep blackish brown, and disposed as in fig. 8. That of the female has these silvery markings of greater extent and better defined than in the male, and with many smaller silvery spots dispersed over the sides and hinder part *vide* (fig. 8).

The *legs* are exceeding long, slender, of a dull yellowish hue, coloured rather lighter than the cephalothorax, and furnished with fine hairs only.

The *palpi* of the male are long, and similar to the legs in colour; the cubital joint is longer than the radial, curved and clavate; the

digital joint is small; the palpal organs rather complex but compact.

*Argyrodes amboinensis* appears to be an abundant species in Amboina, and is perhaps the finest and handsomest yet known of this group; it is certainly one of the most distinct with respect to the form of the caput.

I am indebted to Dr. Thorell for the examples from which my figures and the above notes have been made.

*ARGYRODES SCINTILLULANA*, sp. n. (Plate XXIX. fig. 10.)

Length of the adult male  $\frac{3}{4}$  line, and of the female  $1\frac{1}{4}$  to  $1\frac{3}{4}$ .

The *cephalothorax* is of a deep brown colour; the fore part of the lower part of the caput is produced into a strong, prominent projection, which tapers gradually to a point, and, looked at in profile, has a slightly upward direction, being also furnished with prominent bristly hairs.

The *legs* are very slender; their relative length is 1, 2, 4, 3; those of the first pair are greatly the longest, being nearly four times the length of the Spider itself; they are of a pale yellow-brown hue, and furnished with short fine hairs.

The *palpi* are short, similar in colour to the legs; the radial and cubital joints are very short; the digital joint is also small, oval; and the palpal organs are compact, not very complex, and have a short, curved, spine-like process at their extremity, with a longer, curved transverse spine just behind it.

The *falces* are moderate in length and strength, and, with the maxillæ, which are of normal form, are similar in colour to the cephalothorax, the labium and sternum (also of normal form) being of a darker colour.

The *abdomen* is of a deep brownish sooty-black hue; the posterior extremity is greatly produced, ending in an obtuse and nearly round form. The profile forms an evenly ascending line from the fore to the hinder extremity; and the spinners are placed at an angle nearer to the former than to the latter. Looked at from above and behind, the upperside is marked with two oblique pale stripes on each side on the hinder half; each stripe is charged with a row of irregular silvery spots which sparkle like diamonds in different lights. When looked at in profile there are, besides the stripes of sparkling spots just noted, on each side, at the fore extremity, a shorter horizontal stripe of a similar kind, and a bold round sparkling silvery spot just above the spinners; near the middle of the underside, in a transverse line, there are also two other rather larger round spots of the same kind, and another just beneath the hinder extremity of the produced part.

The abdomen of the female is larger, but less long in proportion, its hinder extremity scarcely so obtuse, and sometimes of a cylindric form. The colours and markings of this sex, however, are the same as those of the male.

Adults of both sexes of this beautiful little Spider were received from Mr. G. H. K. Thwaites, from Ceylon, where they occur in the

webs of the larger Epeirids. This is, to my mind, the most delicately beautiful of all the hitherto known species of this pretty and curious genus.

*ARGYRODES NASUTA*, sp. n. (Plate XXIX. fig. 11.)

Adult male, length  $1\frac{1}{2}$  line.

The *cephalothorax* of this Spider is yellow-brown, the normal grooves and indentations being of a deeper hue. The fore extremity of the lower surface of the caput is produced forwards, in a horizontal direction, into a long, strong projection, enlarged or somewhat spoon-shaped at its extremity, which is furnished with prominent hairs; the length of this projection, which is rather paler in colour than the cephalothorax, about equals the length of the caput.

The *eyes* are in the usual position; but the ocular area, though a little projecting, is not raised above the ordinary level. The profile of the upperside of the caput and thorax, excepting a small impression at the thoracic junction, forms a nearly straight, though slightly ascending line.

The *legs* are very slender, furnished only with short fine hairs; those of the first pair are much the longest, being about, or nearly, four times the length of the Spider; those of the second pair are rather longer than the fourth; and the third pair are the shortest. The legs are of a dull yellowish brown colour, paler than the cephalothorax.

The *palpi* are short, similar in colour to the legs, excepting the digital joints, which are of very large size and of a shining nearly black hue. The palpal organs are not complex, but very compact. The radial and cubital joints are both short, the former being the strongest.

The *falces* are long and moderately strong; they project a little forwards, and, with the maxillæ and labium, which are of normal form, are similar in colour to the cephalothorax.

The *sternum* is of the usual triangular shape, and is of a deep black-brown colour.

The *abdomen* has its hinder extremity greatly produced in a somewhat cylindric form, ending in an obtuse somewhat rounded form. Its colour is blackish brown, paler on the sides; it is marked on the upper part and sides with narrow white stripes, forming on the upperside a large, nearly diamond-shaped figure, and some oblique lines on the sides of the posterior half. The spinners occupy an angular position just halfway between the fore and hinder extremity of the abdomen.

Two examples of this curious Spider were contained in a collection received from Ceylon, from Mr. G. H. K. Thwaites, several years ago. In the form of the fore extremity of the lower surface of the caput we have the tendency to development in that part of the structure of this genus carried to the most extreme limit as yet known.

*ARGYRODES BICORNIS*, sp. n. (Plate XXIX. fig. 12.)

Adult male, length to the spinners 1 line, to the apex of abdomen rather more than  $1\frac{1}{2}$  line.

It is perhaps questionable whether this Spider should not be included in the genus *Ariamnes* (Thor.) rather than in *Argyrodes*, the two genera being very closely united; believing it, however, to have more in common with the latter than with the former genus, I have, for the present at least, placed it in *Argyrodes*.

The form of the caput is very striking, and distinguishes it at a glance from all the Spiders of this singular group yet known to me. The posterior lobe (comprising the ocular area) has its centre produced into a strong, horn-like, slightly curved, tapering, obtusely-pointed eminence, directed forward, surmounted with a tuft of long, strong, bristly hairs also directed forwards; immediately below the fore central pair of eyes, at the upper part of the clypeus (which slopes considerably forwards), is another horn-like prominence directed forwards in a parallel direction with the other, and of about equal length but not nearly so strong, straight, and slightly enlarged at its extremity, which is also furnished with some long bristly hairs directed rather backwards, so as to meet those directed forwards from the extremity of the posterior horn.

The colour of the *cephalothorax* is pale yellow, with a suffusion of reddish brown on the margins, mostly on that of the thorax.

The *legs* are long and slender, especially those of the first pair; their relative length is 1, 2, 4, 3; and they are similar in colour to the cephalothorax; the tibiae, tarsi, and metatarsi of those of the first and second pairs reddish yellow-brown. They are furnished pretty thickly with fine hairs, many of those on the tibiae being erect.

The *palpi* are similar to the legs in colour, moderately long, the radial and cubital joints short and of equal length; the digital joint is rather small, oval, and yellow-brown, with a small notch or cleft at the extremity; the palpal organs are compact, and neither very prominent nor complex.

The *eyes* of the fore central pair form a line at least as long as the hind centrals, if not rather longer, and each is very near to, but not contiguous with, the fore lateral eye on its side. The four centrals thus form, as nearly as possible, a square.

The *falces* project considerably forwards, and, with the maxillae, labium, and sternum, are similar in colour to the cephalothorax.

The *abdomen* has its upperside prolonged into a long tapering eminence directed a little backwards in a sloping form, the apex being bifid in a somewhat fish-tail form. It is of a dull whitish yellow-brown colour, indistinctly marked on each side at its anterior extremity with a rusty-red-brown hue, and with a suffusion of the same colour on the upperside towards and round the apex; some traces of a similar hue are also visible on the hinder part; and there is a central longitudinal line of the same on the underside.

It is very possible that a series of examples would show some variations in the colour and pattern of the abdomen.

A single adult male of this Spider in excellent condition was contained in Mr. H. Rogers's Parana collection. This is perhaps one of the most distinct and singularly formed species, with respect to the caput, yet known.

ARGYRODES SEXTUBERCULATA, sp. n. (Plate XXX. fig. 13.)

Adult male, length to the apex of the abdomen rather over 2 lines. Adult female slightly larger.

The *cephalothorax* is of a deep yellowish-brown colour; the legs and palpi reddish yellow-brown. The fore part of the caput is divided by a narrow fissure into two lobes of equal prominence, the inferior one being the strongest, rounded, consisting, in fact, of the whole of the lower part of the caput. This part bears some resemblance to the corresponding portion of *A. obtusa*, Cambr., but is less prominent, the upper lobe, however, being much more prominent.

The *eyes* are in the ordinary position; those of the hind central pair are divided by an interval but little if any thing larger than that which separates those of the fore central pair.

The *legs* are long and slender, 1, 2, 4, 3; those of the third and fourth pairs are paler than the others, and marked, or somewhat irregularly annulated, with reddish brown.

The *palpi* are short, the radial joint stronger and a little longer than the cubital; the digital joint is large but narrower, and not so large in proportion as that of *A. obtusa*; while the palpal organs are, though differing a little, very similar to those of that species.

The *falces* are long, strong, prominent near their base in front, and similar in colour to the cephalothorax.

The *abdomen* has its hinder extremity considerably prolonged in a somewhat oblong, very slightly tapering form; on each side towards the extremity is an angular prominence, whence it tapers more rapidly, ending in a somewhat truncated form, and with four small angular tubercles or prominences in the form of a square, two above and two beneath. The colour of the abdomen is a dark yellowish brown, more or less thickly covered with pale spots, a sort of longitudinal zone along each side from the lateral prominence to the fore extremity being of a silvery hue, the hinder part of the prominence being blackish-brown. A narrow central longitudinal, tapering, obscure darkish-brown stripe runs from the anterior margin of the upperside, ending in a fine point level with the lateral prominences.

The *abdomen* of the female is more completely covered with silvery spots than that of the male; it is shorter also, though preserving in a still more marked degree a similar form.

This species is allied both to *A. obtusa* and *A. amplifrons* (*postea*, p. 339); but the greater size and different form of the caput, palpi, falces, and abdomen, will serve to distinguish it readily.

Examples, in a very dilapidated state, were found among débris of web &c. in Prof. Traill's Amazons collection.

ARGYRODES ULULANS, sp. n. (Plate XXX. fig. 14.)

Adult male, length from the fore extremity of the caput to the spinners  $1\frac{1}{2}$  line, and to the apex of the abdomen  $2\frac{1}{2}$  lines; the corresponding measurements of the adult female are 2 and 4 lines.

The cephalothorax, legs, palpi, and falces are of a deep yellowish-brown colour. The legs are rather the palest, they are long and slender, 1, 2, 4, 3, and furnished with fine hairs. The fore part of the caput is divided into two lobes, like many others of the genus; but the form of the lobes is very distinct from that of any other species, and very characteristic. The inferior lobe is very strong, obtuse, and, looked at in profile, projects a little beyond the upper one, which is much smaller and transversely impressed just in front of the fore central pair of eyes. These lobes are, like the corresponding ones in other species, clothed with hairs, which are directed over the intervening cleft.

The abdomen is greatly produced backwards, tapering to a blunt conical point; its length from the spinners to the apex is nearly or quite double that from the spinners to the cephalothorax. It is of a dull sooty-black hue, deepening to the apex; the upper part is bordered on each side by a broad longitudinal silvery band, which does not, however, nearly reach the apex; and close behind the spinners, underneath, are two silvery spots in a transverse line.

The palpi are moderately long; the radial and cubital joints are rather short, and of very nearly equal length; the digital joint is large, oval, and devoid of the strong process near the extremity characteristic of that of *Argyroides epeira*, Sim., and several others. The palpal organs are compact and moderately complex, but do not present any very conspicuously prominent processes.

The female is larger, and its abdomen stouter; but in colours and markings the sexes are remarkably alike.

Examples of this species were contained in Prof. Traill's Amazons collection.

ARGYRODES MINAX, sp. n. (Plate XXIX. figs. 15, c, d, e, 15 a, 15 b.)

Adult male, length to the spinners  $1\frac{1}{2}$  line, and to the apex of the abdomen 2 lines.

In the form of the caput this Spider is very like the next species (*Argyroides affinis*, Cambr.). In both Spiders the clypeus is prominent, and divided by a distinct transverse cleft, almost amounting to a simple perforation, so nearly do the adjacent margins of the two segments meet. The present Spider, however, may be distinguished at once by the greater and more gradual rise of the caput from the thoracic region, and by the cleft above mentioned dividing the clypeus into two equal parts, whereas in *A. affinis* it is placed close beneath the fore central eyes (Plate XXX. fig. 16 b). A comparison of the figures given of the two Spiders will render this apparent at a glance.

The cephalothorax, legs, palpi, falces, and other anterior parts are yellow-brown, the legs and palpi being rather the lightest in colour.

The eyes of the hind central pair are further from each other than each is from the hind lateral eye on its side; those of the anterior row are as nearly as possible equidistant from each other.

The legs are long and slender, those of the first pair (judging by the femora, which are all that remained of them) of great length. Their armature consists, as usual, of fine hairs only.

The palpi are moderately long; the digital joints are rather large, oval, and dark yellowish brown; the palpal organs are moderately complex, but compact; the cubital joint is curved and clavate, and longer than the radial.

The abdomen is long, narrow, and slightly tapering to the apex, which is bluff and rounded; and on each side a little before the apex is a small obtusely angular prominence. The general colour of the abdomen is yellowish brown, marked above and on the sides with silvery spots and suffusions; along the middle of the upperside is a long tapering deep-blackish-brown marking, whose posterior extremity, narrowed to a line, reaches very nearly to the apex. The most conspicuous of the silvery markings on the sides form two somewhat irregular oblique lines, the hinder one of which ends in a single spot a little way above and behind the spinners. The area from the spinners to the apex is dark brown; and a little way below the apex are two silvery spots in a transverse line. In the form of the abdomen there is, as will be observed, a striking difference between this species and *A. affinis*.

A single example of the adult male of this very distinct Spider was contained in a small collection of Spiders from the north-east of Madagascar, kindly given me by Mr. R. H. Meade.

*Argyrodes minax* is also nearly allied to *A. ululans*, Cambr. (an Amazons species); but in this latter the transverse cleft of the caput is much deeper, and the form of the segments into which the clypeus is divided is different; the form also of the abdomen is quite dissimilar.

ARGYRODES AFFINIS, sp. n. (Plate XXX. figs. 16, 16 *b*, 16 *c*, 16 *e*).

Adult male, length to the apex of the abdomen  $2\frac{1}{2}$  lines, and to the spinners  $1\frac{1}{4}$ .

This species is allied to *Argyrodes obtusa* and *A. amplifrons*, from both of which it may easily be distinguished by the greater elevation of the hinder part of the ocular area, as well as by the much wider separation of the hind central pair of eyes, and greater width of the upperside of the caput, the prominence of the lower lobe of which is not so bold nor so extended. The abdomen is also of a different form, and its pattern different. The figures detailing these characters will show at once the differences here noted.

The cephalothorax is of a yellow-brown colour; the hinder part of the ocular area is a little raised, giving in profile a slightly angular form to the occiput.



The *legs* are of normal character, long and slender, 1, 2, 4, 3, and furnished only with fine hairs.

The transverse cleft dividing the two lobes of the caput is placed as nearly as possible halfway between the hind central eyes and the prominent extremity of the lower lobe.

The *palpi* are short, and similar in colour to the legs; the cubital joint is curved, clavate, and perceptibly longer than the radial, which, like that of other species, is broad in front. The digital joint is of moderate size, oval, dark yellow-brown in colour. The palpal organs are simple, compact, and very like those of several other species.

The *abdomen* has its posterior portion drawn out into a long tapering form; there is a small angular prominence on each side, a little more than halfway to the apex, which last is obtusely pointed and depressed, or a little bent downwards. This downward bend is probably a characteristic of the species, though very possibly not equally strongly marked in all individuals; it is very perceptible in all the examples I have examined (two adult and one young male, and one adult female). The colour of the abdomen is yellow-brown, mostly covered with brilliant and closely united silvery spots, leaving (in the male) an elongate, central tapering stripe on the upperside. The lower part of the sides, as well as the underside, are nearly free from silvery spots; two, however, are tolerably conspicuous in a transverse line on the hinder part, a little way above the spinners.

In the female the abdomen is shorter, the angular prominence on each side stronger, and it is more completely covered with silvery spots; the disposition, however, of those on the upperside leaves a rather distinct pattern (represented in fig. 16, *d*); probably there would be various differences in this in different examples. The only female that has come under my notice was considerably smaller than the male.

Four examples were contained in a collection of Spiders made for me on the Parana, Brazil, by Mr. H. Rogers, some years ago.

ARGYRODES OBTUSA, sp. n. (Plate XXX. fig. 17.)

Adult male, length to the apex of the abdomen  $1\frac{1}{4}$  line, to the spinners rather less than 1 line.

In this very pretty and curious little Spider, the upper part of the caput is not elevated or drawn out beyond the normal extent, but the whole of the lower part is produced into a very large, obtuse, rounded lobe or prominence divided by a short but distinct cleft or perforation from the upper part of the caput; when looked at from in front, the middle of the upper part of this prominence is slightly notched or cleft.

The colour of the *cephalothorax* is pale yellow-brown, that of the legs and palpi being of a rather paler hue.

The *legs* in the examples examined were much damaged; but they appeared to be very like those of other species of this genus, long, 1, 2, 4, 3, slender, and clothed only with very fine hairs.

The *palpi* are rather short, the cubital and radial joints particularly so; the digital joint is large, and in form very like that of *A. ululans*, being devoid of the prominence so very strongly marked in *A. epeiræ* and others. The palpal organs are simple in structure, but prominent and well developed, with a short, closely fitting, curved black spine near their anterior extremity.

The *eyes* are in the ordinary position; those of the hind central pair are separated by a wider interval than those of the fore central pair.

The *falces* are neither very long nor strong; and their direction is a little forwards.

The *abdomen* has its upper part produced backwards into a long, somewhat tapering form, its extremity being slightly and imperfectly trifid, *i. e.* a blunt angular point on each side below, and a third, rather longer, above and directed rather downwards; its ground-colour is of a dull brownish hue (though, the examples being in bad condition, this may be different in life), marked with a pattern of brilliant silvery spots as represented in fig. 17; the hinder part of this pattern meets over the upperside; there is also a single conspicuous silvery spot almost underneath on each side near the hinder extremity, and another in the middle of the underside a little way in front of the spinners.

One tolerably perfect example, and some fragments of others, were found among débris of the web of some large Epeirid, in Prof. Traill's Amazonas collection.

ARGYRODES AMPLIFRONS, sp. n. (Plate XXX. figs. 17 *a'*, *d'*, *e'*, 17 *b'*, *c'*, *d'*, *e'*, *f'*, *g*, *h*.)

Adult male, length to the spinners scarcely 1 line, and to the apex of the abdomen  $1\frac{1}{2}$ ; in the adult female these measurements are, respectively,  $\frac{4}{5}$  of a line and rather more than  $1\frac{1}{2}$  line.

This Spider is very nearly allied to *Argyrodes obtusa*, but may be distinguished by several well-marked differences. The prominence of the lower part of the caput (or inferior lobe) is much larger, still more obtuse; and its upper part, when looked at from in front, is more considerably cleft or bifid; the space also between the cleft or perforation which divides the lobe and the fore central eyes is more prominent. The abdomen is more elongated, and more distinctly trifid at its apex; and the silvery markings are merely two small patches of spots on each side, a small spot on each side rather underneath near the apex, another in the middle of the underside a little way in front of the spinners, and two more in a transverse line behind them.

The *palpi* are very like those of *A. obtusa*; and the general colouring and appearance of the whole Spider is also very similar.

The female has the anterior part of the abdomen much more tumid, more perpendicular in its direction, and its apex more conspicuously trifid; its whole surface is silvery, excepting a longitudinal, not very distinctly defined, central longitudinal band on the upperside extending quite to the apex, and a pointed stripe on the

hinder part of each side, leaving a broad silvery band from the apex to the spinners.

Examples, for the most part much damaged, were found in Prof. Traill's Amazons collection in company with those of *A. obtusa*.

*ARGYRODES INFELIX*, sp. n. (Plate XXX. fig. 18.)

Adult female, length to the spinners  $1\frac{1}{2}$  line, and to the apex of the abdomen very nearly 2 lines.

The *cephalothorax* is of a very flattened convex form above; the ocular area is a little elevated, and the clypeus (which in height is no more than half that of the facial space) is rather prominent; the profile line of both the caput and thorax is very level, and forms but a very slight curve; the ordinary lateral converging indentations are obsolete, and the thoracic indentation is but very slightly marked. The surface of the whole is roughened or granulose, covered with small impressed points, and clothed with pale coarse hairs; its colour is yellow-brown.

The *eyes* are in the ordinary position; the four centrals form a square, those of the hind central pair are slightly closer to each other than each is to the hind lateral eye on its side, while the intervals between those of the anterior row appeared to be equal to each other.

The *falces*, *maxilla*, *labium*, and *sternum* are of normal form, and similar to the cephalothorax in colour.

The *legs* are moderately long, slender, 1, 2, 4, 3, rather paler in hue than the cephalothorax, and clothed with rather long coarse hairs.

The *palpi* are short and slender; they resemble the legs in colour, are similar in their armature, and terminate with a curved claw.

The *abdomen* has its posterior extremity produced in a tapering form to an obtusely conical apex. It is of a dull luteous yellow-brown hue, with some faint traces of red-brown markings on the upper-side, and thinly clothed with coarse hairs; the plates of the spiracles are reddish yellow-brown; and the genital aperture is small, inconspicuous, and has no process connected with it.

A single example of this species was contained in Prof. Traill's Amazons collection. Although it presents some rather abnormal characters, I consider it to belong to the genus *Argyrodes*. Probably the abdomen, in the only example before me, had lost its real colour; and its markings had perhaps become obliterated; still the peculiar characters furnished by the form and surface of the cephalothorax will hardly fail to enable the species to be easily determined.

*ARGYRODES FELIX*, sp. n. (Plate XXX. fig. 19.)

Adult female, length to the extremity of the abdomen  $2\frac{1}{4}$  lines, and to the spinners  $1\frac{1}{2}$ .

The cephalothorax, legs, palpi, and falces of this pretty Spider are yellow-brown. The legs are moderately long, 1, 2, 4, 3, and furnished with fine hairs only.

The *abdomen* is large, and of a somewhat imperfectly globular form; on each side, towards the hinder extremity of the upper part, is a small subconical eminence; and the hinder extremity itself ends with three larger, subconical, nipple-like protuberances, two in a transverse line below and one in the middle above; the under ones are the longest, and a little divergent from each other. The colour of the abdomen is dark blackish brown, with a broad longitudinal band along the upperside, pointed in front and of a pale yellow-brownish hue; this band includes the posterior prominences, and emits a prominent stripe of a similar colour on each side a little in front of the middle, and also has along its centre two black patches, of a somewhat diamond-shape; the anterior patch fits pretty closely into the fore extremity of the band, and is sometimes lost in connexion with the surrounding ground-colour. On each side of the abdomen near its hinder extremity, and beginning at the subconical eminence above noted, another pale yellowish-brown stripe runs downwards and a little obliquely backwards towards the spinners, above which, and in a line with the oblique stripe, is a circular spot or patch of a similar colour. The hinder part of the abdomen is sometimes marked with a similarly coloured band running downwards towards the spinners. Also on each side of the fore extremity of the abdomen, a little above the junction with the cephalothorax, is another, short, rather oblique band or patch of pale yellowish brown, its hinder extremity ending in a largish circular spot. All these pale markings are ornamented with brilliant silvery blotches and spots, two others of which are also conspicuous in a transverse line on the underside a little way in front of the spinners.

Three female examples of this very distinct species were contained in a collection of Spiders made for me in Brazil (Parana) by Mr. Henry Rogers.

ARGYRODES NIGRA, sp. n. (Plate XXX. fig. 20.)

Adult male, length  $1\frac{1}{3}$  line; female  $1\frac{2}{3}$ .

The cephalothorax, legs, palpi, falcēs, maxillæ, labium, and sternum of this species are deep black-brown, excepting the two basal joints and a small portion of the posterior extremity of the femora of the legs, which are pale whitish yellow—the abdomen being quite black, without markings of any kind.

The middle of the ocular area is prominent; but the lower part of the fore extremity of the caput is devoid of any prominence or protuberance. The eyes of the fore central pair are larger and wider apart than those of the hind central pair; in other respects the eyes do not appear to differ from those of the typical species of *Argyrodes*. The relative length of the legs is 1, 4, 2, 3, thus differing from that of other *Argyrodes*; the maxillæ also are rather less strong, more pointed at their extremity, and inclined perceptibly towards the labium; the legs are furnished with longish pale hairs, both erect and semi-erect.

The *palpi* are slender and moderately long; the radial and cubital joints are very short; the digital joint is very large; and the

palpal organs, which are rather simple in structure, are surrounded on their outer side by a long, strong, corneous, spine-like process, which originates at their centre, and whose obtuse extremity projects beyond the extremity of the digital joint.

The *abdomen*, looked at from above and behind, is elongated narrow oviform, more or less pointed at its posterior extremity; seen in profile, the normal hinder part is produced into a long, slightly curved, tapering prolongation, the spinners being generally nearer to the fore extremity of the abdomen than to the point of elongation.

The female resembles the male in colours, excepting the legs, which are of a uniform pale whitish yellow, the palpi being black-brown; the abdomen also is shorter, but very broad at its fore extremity.

It is with some hesitation that I have described this Spider as an *Argyrodes*. Numerous examples of both sexes were included in Mr. Thwaites's Ceylon collection.

*List of Species above noted and described, with references to locality, page, plate, and figures.*

- Argyrodes flavescens*, sp. n., p. 321, Pl. XXVIII. fig. 1. Ceylon.  
 — *concinna*, sp. n., p. 322, Pl. XXVIII. fig. 2. Amazons.  
 — *epciræ*, Sim., p. 323, Pl. XXVIII. fig. 3 a. S. Europe and Madagascar, Asia and Africa.  
 — *samoensis*, sp. n., p. 323, Pl. XXVIII. fig. 3. Samoa Islands.  
 — *nephilæ*, Tacz., p. 324, Pl. XXVIII. figs. 4, 4 a, 4 b, c, 4 c, 4 d, f. Amazons.  
 — *argentata*, sp. n., p. 325, Pl. XXVIII. fig. 5. Amazons, Ceylon, Madagascar, and East Indies.  
 — *rostrata*, Bl., p. 325, Pl. XXVIII. figs. 4 a', 4 b'. Seychelle Islands.  
 — *jucunda*, sp. n., p. 326, Pl. XXVIII. fig. 6. Parana, S. America.  
 — *antipodiana*, sp. n., p. 327. Australia and New Zealand.  
 — *lugens*, sp. n., p. 327, Pl. XXVIII. figs. 2 a', b', c'. Amazons.  
 — *abscissa*, sp. n., p. 328, Pl. XXIX. fig. 7. Madagascar.  
 — *fissifrons*, Cambr., sp. n., p. 329, Pl. XXIX. fig. 8 a'. Ceylon, Amboina.  
 — *procrastinans*, sp. n., p. 330, Pl. XXIX. fig. 9. Bombay.  
 — *inguinalis*, Thor., p. 330, Pl. XXIX. fig. 9 a'. Amboina.  
 — *amboinensis*, Thor., p. 331, Pl. XXIX. fig. 8. Amboina.  
 — *scintillulana*, sp. n., p. 332, Pl. XXIX. fig. 10. Ceylon.  
 — *nasuta*, sp. n., p. 333, Pl. XXIX. fig. 11. Ceylon.  
 — *bicornis*, sp. n., p. 334, Pl. XXIX. fig. 12. Parana, S. America.  
 — *sextuberculata*, sp. n., p. 335, Pl. XXX. fig. 13. Amazons.  
 — *ululans*, sp. n., p. 336, Pl. XXX. fig. 14. Amazons.  
 — *minax*, sp. n., p. 336, Pl. XXIX. figs. 15, 15 a, 15 b. Madagascar.  
 — *affinis*, sp. n., p. 337, Pl. XXX. figs. 16, a, d, j, h, f, g, 16 b, 16 c, 16 e. Parana.  
 — *obtusa*, sp. n., p. 338, Pl. XXX. fig. 17. Amazons.  
 — *amplifrons*, sp. n., p. 339, Pl. XXX. figs. 17 a', d', c', 17 b', c', d', e', f', g, h. Amazons.  
 — *infelix*, sp. n., p. 340, Pl. XXX. fig. 18. Amazons.  
 — *felix*, sp. n., p. 340, Pl. XXX. fig. 19. Parana.  
 — *nigra*, sp. n., p. 341, Pl. XXX. fig. 20. Ceylon.

## EXPLANATION OF THE PLATES.

## PLATE XXVIII.

- Fig. 1. *Argyrodes flavescens*, sp. n.  
*a*, ♂ in profile; *b*, ♀ in profile; *c*, abdomen (♀) on upperside;  
*d*, right palpus on outer side; *e*, length of ♀; *f*, length of ♂.
2. *Argyrodes concinna*, sp. n., Spider in profile.  
*a*, length to spinners; *b*, length to apex of abdomen.
- 2*a*. *Argyrodes lugens*, sp. n., Spider in profile.  
*U*, abdomen on upperside; *c*', Spider, natural size.
3. *Argyrodes samoensis*, sp. n., Spider in profile.  
*a*, natural length.
- 3*a*. *Argyrodes epeiræ*, Sim., portion of Spider in profile.  
*b*, natural length of Spider.
4. *Argyrodes nephilæ*, Tacx., Spider in profile (♂).  
 4*a*, abdomen (♀) in profile; 4*b*, abdomen (♂) on upperside; *e*,  
 genital process of ♀; 4*c*, abdomen (♀) on upperside; 4*d*, ♂ Spider  
 from above, with legs and palpi cut off; *f*, natural length of Spider  
 (♂).
- 4*a*. *Argyrodes rostrata*, Bl., caput in profile.  
 4*U*, Spider in profile.
5. *Argyrodes argentata*, sp. n., Spider (♂) in profile.  
*a*, abdomen (♂) on upperside; *b*, abdomen (♀) in profile; *c*,  
 natural length of Spider (♂).
6. *Argyrodes jucunda*, sp. n.  
*a*, Spider in profile; *b*, abdomen on upperside; *c*, caput in profile;  
*d*, Spider in profile, natural size.

## PLATE XXIX.

- Fig. 7. *Argyrodes abscissa*, sp. n., Spider in profile.  
*a*, cephalothorax in profile, more enlarged; *b*, caput from in front;  
*c*, abdomen on upperside; *d*, length of Spider to the spinners; *e*,  
 length of Spider to the apex of abdomen.
8. *Argyrodes amboinensis*, Thor.  
*a*, Spider (♂) in profile; *b*, caput in profile, more enlarged; 8*c*, ab-  
 domen (♀) in profile; *d*, length of ♂ to spinners; *e*, length of ♂ to  
 apex of abdomen; *f*, length of ♀ to spinners; *g*, length of ♀ to apex  
 of abdomen.
- 8*a*. *Argyrodes fissifrons*, Camb., cephalothorax of Spider (♂) in profile.
9. *Argyrodes procrastinus*, sp. n., Spider in profile.  
*a*, abdomen on upperside; *b*, length to spinners; *c*, length to extre-  
 mity of abdomen.
- 9*a*. *Argyrodes inguinalis*, Thor., abdomen on upperside.
10. *Argyrodes scintillulana*, sp. n.  
*a*, Spider in profile; *b*, length of ♂; *c*, length of ♀ to extremity  
 of abdomen, and to spinners.
11. *Argyrodes nasuta*, sp. n.  
*a*, Spider in profile; *b*, caput from above; *c*, profile of caput, more  
 enlarged; *d*, length of Spider to extremity of abdomen.
12. *Argyrodes bicornis*, sp. n., Spider in profile.  
*a*, profile of cephalothorax; *b*, abdomen, upperside; *c*, length of  
 Spider to spinners; *d*, length of Spider to apex of abdomen.
15. *Argyrodes minax*, sp. n., Spider in profile.  
*c*, abdomen on upperside; *d*, length of Spider to spinners; *e*, length  
 of Spider to extremity of abdomen; 15*a*, profile of cephalothorax;  
 15*b*, caput from in front.

## PLATE XXX.

- Fig. 16. *Argyrodes affinis*, sp. n., Spider (♂) in profile.  
*a*, caput (♂) from in front; *d*, abdomen (♀), upperside; *j*, length

of ♀ to spinners; *h*, length of ♀ to extremity of abdomen; *f*, length of ♂ to extremity of abdomen; *g*, length of ♂ to spinners; 16 *b*, profile of cephalothorax; 16 *c*, abdomen of ♂ on upperside; 16 *e*, abdomen of ♀ in profile.

Fig. 17. *Argyrodes obtusa*, sp. n., Spider in profile.

*b*, profile of cephalothorax; *c*, caput from in front; *j*, length of Spider to extremity of abdomen; *k*, length of Spider to spinners.

17 *a*. *Argyrodes amplifrons*, sp. n., Spider in profile.

*d*, length of Spider to spinners; *e*, length of Spider to extremity of abdomen; 17 *b*, profile of cephalothorax; *c*, caput from in front; *d*, profile of spider (♀); *e*, extremity of abdomen (♂); *f*, extremity of abdomen (♂), from below; *g*, length of ♀ to spinners; *h*, length of ♀ to extremity of abdomen.

13. *Argyrodes sextuberculata*, sp. n., Spider in profile.

*a*, profile of cephalothorax; *b*, abdomen from above; *c*, length of Spider to extremity of abdomen.

14. *Argyrodes ululans*, sp. n., Spider in profile.

*a*, profile of caput; *b*, caput from in front; *c*, length of Spider (♂) to spinners; *d*, length of Spider (♂) to extremity of abdomen; *e*, length of ♀ to extremity of abdomen; *f*, length of ♀ to spinners.

18. *Argyrodes infelix*, sp. n., Spider in profile.

*a*, abdomen on upperside; *b*, length of Spider to spinners; *c*, length of Spider to extremity of abdomen.

19. *Argyrodes felix*, sp. n.

*a*, Spider in profile; *b*, length of Spider to spinners; *c*, length of Spider to extremity of abdomen.

20. *Argyrodes nigra*, sp. n.

*a*, Spider in profile; *b*, Spider in profile, from upperside; *c*, length to spinners; *d*, length to extremity of abdomen.

#### 4. On the Shells of Lake Tanganyika and of the Neighbourhood of Ujiji, Central Africa. By EDGAR A. SMITH.

[Received April 6, 1880.]

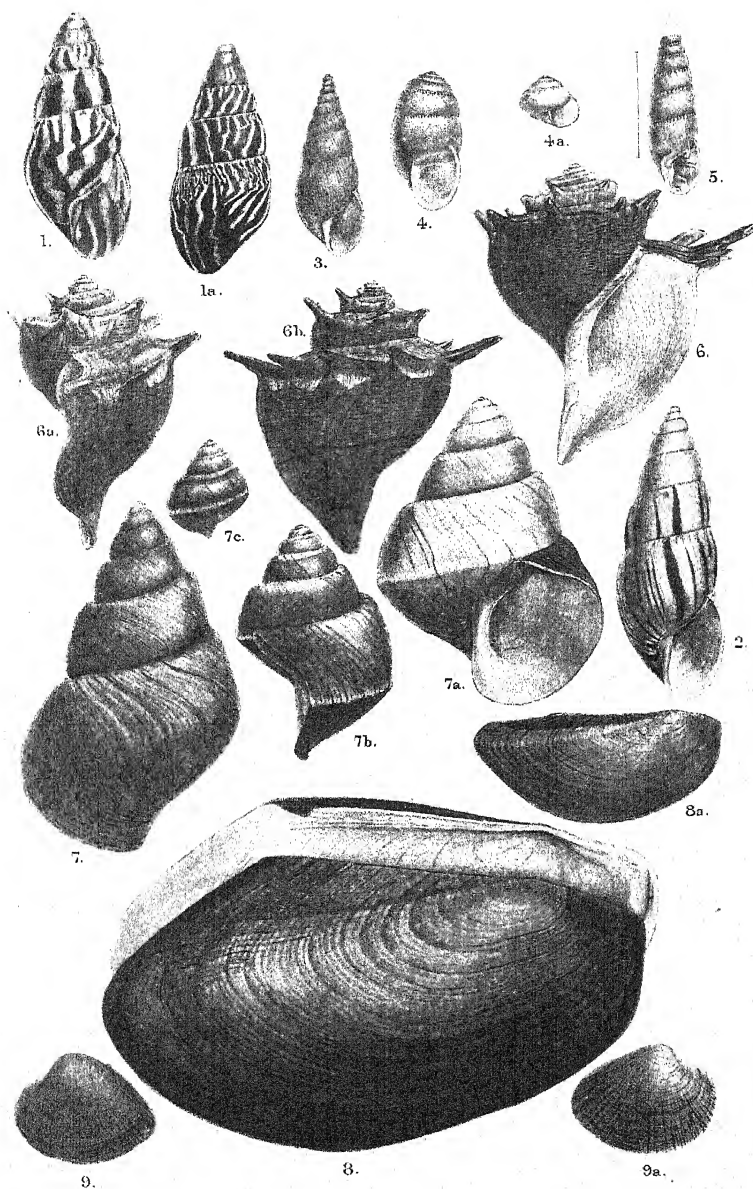
(Plate XXXI.)

In the year 1877 I had the pleasure of communicating to the Society a paper on the shells found in Lake Nyassa. It is now my privilege to lay before it an account of the known mollusks inhabiting another of the large African lakes, namely Tanganyika.

Mr. Edward Coode Hore, of the London Missionary Society's Tanganyika Mission, stationed at Ujiji, sent a collection of shells to his brother, Mr. John Coode Hore; and the latter has liberally presented them to the British Museum in his brother's name.

The only shells hitherto recorded from this particular region were collected by Captain Speke some twenty years ago, and described in these 'Proceedings' (1859) by Mr. S. Woodward; they were four in number, viz. *Pleiodon spekei*, *Lithoglyphus zonatus*, *Melania nassa*, and *Unio burtoni*. The last of these is the only form not included in Mr. Hore's collection.

The latter comprises twenty-one species, nine of which are new and interesting forms. Of these I would particularly call attention to *Tiphobia horei* and *Neothauma tanganyicensis*, both of which are new



A.H. Searle del et lith.

Minuart Bros imp.

SHELLS FROM UJIJI AND LAKE TANGANYIKA.





generic forms and unlike any other, either recent or fossil. The former with its spine-bearing whorls calls to mind certain marine rather than lacustrine genera; and the latter, although very *vivipariform*, yet differs from all the species of that family in possessing a sinuated outer lip and an effuse base to the aperture. Of the terrestrial shells one, *Limicolaria nilotica*, has previously been recorded from more northern Nilotic regions; and the same observation applies to five species from the lake, viz. *Ampullaria ovata*, *Planorbis sudanicus*, *Mutela exotica*, *Unio niloticus*, and *Ætheria elliptica*.

1. ACHATINA (LIMICOLARIA) NILOTICA, Pfeiffer.

*Bulimus niloticus*, Pfr. P. Z. S. 1861, p. 24; Mal. Blät. 1861, p. 14; Mon. Hel. vi. p. 86; Mon. Hel. viii. p. 268 (*Limicolaria nilotica*).

*Achatina (Limicolaria) nilotica*, Pfr.; Martens, Mal. Blät. 1865, p. 196, 1870, p. 32 (as *Achatina nilotica*); Novitates Conch. iv. pl. 110. f. 1-3.

This species appears to be common in the Upper-Nile region. It was first collected in the White-Nile district, and subsequently by Dr. Schweinfurth near the Gazelle River.

A narrowly ovate specimen is 111 millims. in length and only 50 in diameter, and the aperture occupies only a little more than half the length, whilst in a specimen from the White-Nile district it equals  $\frac{7}{10}$  of the total length.

2. ACHATINA (LIMICOLARIA) MARTENSIANA, sp. nov. (Plate XXXI. figs. 1, 1a).

Shell rimate, rather solid, oblong, turreted, reddish towards the apex, elsewhere dark purple-red or almost black, variegated with oblique, more or less zigzag, opaque creamed-coloured stripes, some of which extend from suture to suture, others only a short distance from the top of the whorls. The latter are  $7\frac{1}{2}$  in number, scarcely convex or almost flat, and very feebly constricted beneath the suture. The upper ones are finely granosely decussated, the last and the penultimate being smooth and merely marked with the oblique incremental striæ. All exhibit a fine plication or puckering beneath the suture, beneath which an impressed line is sometimes observable upon the last and preceding volutions. Aperture bluish within, displaying more or less of the external striping, vertical, equalling about two fifths of the shell's length. Columella suberect, bluish and dark violet, scarcely forming any angulation at the base with the lower margin of the peritreme. Length 36 millims., diam. 17; aperture  $14\frac{1}{2}$  long, 8 wide.

This handsome shell approximates very closely to *A. heuglini* of Martens in form, but has certain differences in colour and sculpture, which, however, may prove to be only varietal. *A. heuglini*, from South Abyssinia and the Gazelle River, is said to be regularly striated, and of a horny lutescent colour flamed with red. *A. martensiana*, on the contrary, is finely granosely decussated upon the spire, and the coloration is very rich and striking. The dark purplish red, which

in some specimens is almost black, predominates; and the opaque, obliquely somewhat zigzag stripes upon the back of the body-whorl in several shells are abruptly terminated in an oblique line which marks a period of growth. Between the larger creamy stripes which reach from suture to suture in the upper whorls, and extend over the whole extent of the last, there are minor streaks and spots flowing only a short distance beneath the suture.

I feel much pleasure in naming this species (perhaps only a variety, but a very interesting one) after Professor Martens, of the Berlin Museum, who, amongst his innumerable and valuable conchological papers, has written several upon the fauna of the Nilotic region.

3. *ACHATINA (LIMICOLARIA) RECTISTRIGATA*. (Plate XXXI. fig. 2.)

Shell oblong, cylindrically conical, narrowly perforate, whitish or of a pale rosy tint, varied with oblique brown stripes, which at times become broader or blotchy at the lower part of the whorls. The latter are 8 in number, rather convex and slowly enlarging, obliquely striated by the lines of growth, divided by a simple subhorizontal suture. Last volution oblong, a little attenuated at the lower part. Aperture inversely subauriform, whitish or pale rose within, equalling rather more than one third of the entire length of the shell. Peristome (viewed laterally) oblique, a little tortuous, thin at the edge, and inconspicuously thickened within. Columella spirally contorted, bluish, and reflexed over the perforation at the upper part, brownish inferiorly, and gradually curving into the basal margin of the aperture. Paries coated with a thin callosity. Length 44 millims., diam. 17; aperture 16 long, 8 wide.

The peculiarity of this species consists in the ornamentation taking the form of defined stripes, and not exhibiting a wavy or zigzag tendency so common to most of the species of this group of *Achatina*. *L. cailliaudi*, Pfeiffer, and *L. sennaariensis*, Shuttlesworth, are allied forms.

4. *BULIMUS (BULIMINUS) PTYCHAXIS*. (Plate XXXI. fig. 3.)

Shell elongate, turreted, perforate, thin, dirty white, covered with a very thin, pale, sordid olive epidermis. Spire elongate-conical, with a rather obtuse apex. Whorls 9, somewhat convex, divided by a deepish suture, bearing fine, regular, oblique and slightly flexuous costulae, which, upon the last whorl, become less pronounced from the middle downwards. Aperture vertical, occupying about one third of the length of the shell. Columella erect, reflexed over the umbilicus, bearing a fine oblique plait a little below the middle; outer lip thin and feebly expanded. Length 27 millims., diam.  $10\frac{1}{2}$ ; aperture 9 long, 5 broad.

*B. kirki* of Dohrn, from Mozambique, is sculptured very similarly to this species. It is, however, much shorter, and does not possess a columellar fold. The latter is even more distinct in the young shell than in the adult; and the last whorl in the former exhibits a faint

angulation at the middle, beneath which the costulate sculpture becomes almost obsolete and the surface comparatively smooth and shining. In the mature shell this angulation disappears, and the strength of the sculpture decreases insensibly.

5. *ENNEA LATA*, sp. nov. (Plate XXXI. figs. 4, 4 a.)

Shell ovately pupiform, rimate, transparent white, thinnish, obliquely striated and finely serrated beneath the suture. Whorls 7, rather convex, penultimate nearly as broad as the last; this is attenuated somewhat at the base, ascends anteriorly, is faintly flattened in front above the aperture, where it is rather smoother than elsewhere. Spire obtuse, scarcely at all conoid at the apex. Aperture nearly vertical, occupying about three sevenths of the entire length, without teeth. Peristome a little thickened and everywhere narrowly reflexed. Columella dilated, united to the outer lip by a thin glossy callosity. Length 20 millims., diam. 11; aperture 9 long,  $7\frac{1}{2}$  broad.

*E. anodon* of Pfeiffer somewhat resembles this species. It is, however, smaller, more conical at the summit, and has a simple unserrated suture. From the serrations or denticles flow downwards fine oblique but little raised costulae, which are scarcely observable to the unassisted eye. The labrum, viewed laterally, is seen to be obliquely but slightly curved; the columella too is also sloped or receding.

6. *ENNEA UJJIENSIS*, sp. nov. (Plate XXXI. fig. 5.)

Shell elongate, cylindrical, thin, obliquely rimate, pale horny colour, obliquely costulate, the costulae being not much elevated, and prettily dentiform above at the suture. Whorls 10? Apex? The six remaining volutions are slightly convex, slowly increasing, the penultimate as broad or even a trifle broader than the last, which is deeply transversely grooved behind by two parallel furrows which do not extend quite to the lip. Aperture subvertical and subauriform, furnished with folds: one upon the paries is elevated, thin, lamellar, extending right within the mouth; two others, equally large and reflexed at their top, are situated upon the outer lip, stretching far inwards, but not attaining to the margin; beneath these two and beneath the lower one there are one or two minor ridges. The columella has a subbasal oblique fold, and a smaller dentiform plait at the upper part. The peristome is prominent and a little expanded, the dextral margin being situated near the upper extremity and prominent in the middle, the columellar edge rather reflexed. Probable length 19 millims., actual length of six whorls 17 millims., diam.  $5\frac{1}{3}$ ; aperture 5 long, 4 wide.

This species must be very closely related to *E. papillifera*, Jickeli, from Abyssinia, which is only known to me by description. The latter, however, is not half the length of *E. ujjiensis*, appears to be very finely striated and with five plicae within the aperture, whilst the present species is distinctly costulated and has two or three additional internal ridges.

7. *AMPULLARIA OVATA*, Olivier.

*Ampullaria ovata*, Olivier, Philippi in Küster's Con. Cab. pl. 14. f. 5-6; Reeve, Con. Icon. f. 64.

*A. kordofana*, Parreyss, Philippi, l. c. pl. 13. f. 1.

The more globose form of this species (*kordofana*) is the one received from Mr. Hore at Tanganyika. The epidermis of all the specimens is of a peculiarly dark olive tint.

8. *MELANIA (MELANELLA) NASSA*, Woodward, Proc. Zool. Soc. 1859, p. 349, pl. 47. f. 4; Reeve, Conch. Icon. fig. 216; Brot. Conchyl. Cab. pl. 6. f. 7.

Among several specimens sent by Mr. Hore, one is especially worth referring to. It is exceptionally elongated, and, although undoubtedly belonging to this species, at first sight looks distinct. Its dimensions are—length 14 millims., diam.  $6\frac{1}{2}$ ; aperture only 6 long,  $3\frac{1}{2}$  wide.

Another specimen is 20 millims. long, 10 broad, and its aperture has a length of 11 millims. and a width of  $6\frac{1}{2}$ .

## TIPHOBIA\*, nov. gen.

Shell subturbinatè; spire depressed; whorls flattened above, angulated and spinose; axis and aperture prolonged into a channelled beak; epidermis none. Operculum — ?

The character of the prolonged axis is very similar to that obtaining in several species of the genus *Io*. The great difference of form and the absence of an epidermis are, I think, sufficient distinctions to warrant a generic separation. Not knowing the animal or its operculum, it is impossible to say to what family it belongs; but it may temporarily be classed with the Melaniidæ.

9. *TIPHOBIA HOREI*. (Plate XXXI. figs. 6-6 b.)

Shell somewhat turbinatè, with a short turreted spire, prolonged inferiorly into a narrow rostrum, thinnish, semitransparent. Whorls 6, flattened above, rectangular, and keeled in the middle, with rather long, tapering, hollow compressed spines arising from the keel and directed slightly upward. Sculpture consisting of fine close spiral or transverse lirulæ crossed by obliquely flexuous lines of growth, which, towards the aperture, are particularly strongly marked, forming fine plications. Aperture irregularly pyriform, lined with a bluish-white and glossy enamel, together with the basal beak occupying about  $\frac{1}{10}$  of the entire length of the shell. Columella nearly straight, only faintly arcuate in the middle, and a trifle bent to the left beneath, covered with a smooth dirty-white callosity extending over the whorl, and joining the lip at its upper extremity; the latter is shallowly sinuated above and below the angle, and arcuately prominent about and beneath the middle. Rostrum a little oblique and scarcely recurved, shallowly grooved. The colour may be described as dirty or greyish transparent white feebly tinted with

<sup>1</sup> From *τίφος*, a pond, and *βίωω*, to live,

olive, the front of the body-whorls being more or less stained by a reddish earthy deposit. The spines and the keel are also of a browner tint than the rest of the shell. Length 45 millims., greatest diameter 34; aperture 35 long, 16 broad.

This is perhaps the most remarkable species of freshwater Mollusca yet discovered. Its strange form, the array of spines at the angles of the volutions, the prolonged beak, the pretty sculpture, and the lack of an epidermis give this shell a unique character among all others. The number and proximity of the spines vary in different specimens; the largest shell has the unusual number of fourteen on the last whorl, five of them being quite close together near the aperture. One example differs from the rest in having a narrow olivaceous line around the middle of the body-whorl.

#### NEOTHAUMA<sup>1</sup>, nov. gen.

Shell like that of the genus *Vivipara*, but having the aperture effuse and slightly channelled at the base, and the outer lip rather deeply yet widely sinuated in the middle. Animal and operculum unknown.

The aperture in the genus *Vivipara* is, as a rule, more or less circular or ovate, and the continuous peritreme is generally almost level or on one plane. In the present genus on the contrary, the form of it is irregular and angular, and the labrum is deeply emarginate, causing the level of the peristome to vary considerably.

#### 10. NEOTHAUMA TANGANYICENSE. (Plate XXXI. figs. 7-7c.)

Shell ovate, acuminate, solid, scarcely rimate, white, clothed with an olive-brown epidermis. Young shells exhibited two brown bands upon the upper whorls and three on the last. Whorls 7, roundly shouldered above, obliquely convexish at the sides, separated by a very deep horizontal suture, sculptured with oblique flexuous lines of growth and a few faintly impressed spiral striæ. Last whorl (with one exception) angular and keeled at the middle. Aperture irregularly triangularly ovate, bluish white within, effuse at the base. Columella thick, slightly arcuate, white; callus reflexed, almost concealing the umbilical perforation, joining the upper extremity of the outer lip; the latter is thin, a little angular in the middle at the termination of the keel around the whorl, and when viewed laterally is seen to be deeply and widely sinuated. Length 53 millims., diam. 29; aperture 24 long, 19 broad. Another specimen, length 46 millims., diam. 29; aperture 23 long, 19 broad.

The largest specimen whose dimensions are given above is of abnormal growth, and exhibits scarcely any trace of the strong angle and keel which is so characteristic of the species. The colour bands are distinct in the young shell, but with age entirely disappear.

11. *PLANORBIS SUDANICUS*, Martens, Mal. Blät. 1870, p. 35, 1874, p. 41; Novitates Conchyl. vol. iv. pl. 114. f. 6-9.

This species is very like the West-Indian *P. guadelupensis*, but

<sup>1</sup> From *véos*, new, and *θαύμα*, a wonder.

certainly flatter. The largest of the Tanganyikan specimens exceeds the dimensions given by Martens, and consists of  $5\frac{1}{2}$  whorls. Its greatest diameter is 18 millims., smallest 15; and the aperture is 5 broad and 5 high. Smaller examples are precisely of the same size as the original type. The colour of the freshest specimens is light horny brown above, and paler on the undersurface.

12. *LITHOGLYPHUS ZONATUS*, Woodward, Proc. Zool. Soc. 1859, p. 349, pl. 47. f. 3-3c.

In both the specimens sent by Mr. Hore the umbilical callosity completely conceals the rimation. The lip and the edge of the basal excavation are remarkably acute. The whorls are four and a half in number, rapidly enlarging, and convex.

13. *PLEIODON SPEKEI*, Woodward, Proc. Zool. Soc. 1859, p. 348, pl. 47. f. 2; *Conchologia Iconica*, vol. xvi. f. 2; Küster's *Con. Cab. (Iridina)*, pl. 70. f. 1.

Two odd valves only of this fine species are in the collection sent by Mr. Hore. The larger is of greater length than the specimen described by Woodward, being nearly  $5\frac{1}{2}$  inches long and  $2\frac{3}{8}$  broad; and the internal nacre is of the same salmon-colour. On the contrary, the second valve is pearly white within, proportionally broader, less sinuated at the basal margin, with the umbo more remote from the anterior extremity, the muscular scars less deep, and the pallial line further within the valve.

14. *MUTELA EXOTICA*, Lamarck.

*Iridina exotica*, Lamarck, An. s. Vert. ed. 2, vol. vi. p. 571; Reeve's *Conch. Icon.* f. 2.

*I. nilotica*, Sowerby, Zool. Journ. vol. v. pl. 2; *Conch. Icon.* f. 4; Küster, *Con. Cab.* pl. 25. f. 3.

This is the first record of this species from so southern a locality. Only a single valve, about three inches in length, was obtained.

15. *SPATHA TANGANYICENSIS*. (Plate XXXI. figs. 8, 8a.)

Shell transverse, irregularly elliptic, somewhat winged, very inequilateral, gaping considerably anteriorly, and slightly at the opposite extremity, concentrically sulcate; hinge-line rectilinear; anterior end regularly curved, commencing at right angles to the straight dorsal margin, and gradually curving obliquely into the base or lower margin; posterior end rather acuminate produced. The acumination is sharply rounded, and formed by the upward sweep of the ventral curve and the upper lateral slope, which is obliquely subrectilinear, and joins the dorsal line at an angle of about 65 degrees. Epidermis brownish-olive, marked with very fine radiating and close-set dark greenish-olive lines. Hinge with a single thin lamellar tooth in each valve, extending from the umbo nearly as far as and almost in a line with the dorsal margin. Anterior scar large, irregular, indistinctly bipartite; posterior one also large, transverse. Beneath the hinge-line, a little posterior to the umbones, are two or

three smaller muscular scars, irregular in form and position. Nacre beautifully iridescent, pinkish purple being the predominating hue. In young specimens a bluer tint prevails. Width 90 millims., length 43, diam. 15.

The young shells take a very different form from the adult. They have quite an upcurved rostrated posterior end, such as is met with in certain species of *Leda* or *Yoldia*, e. g. *L. patagonica*, D'Orbigny, and *Y. limatula*, Say; but this form becomes modified as the creature enlarges its shell and the alation increases.

*Spatha alata* of Lea, from Lake Nyassa, is closely allied to the present species, but differs in being more tumid, much more winged, having the anterior end more obtusely curved, and in lacking the elongate lamellar teeth. The presence of the latter might be regarded by some as a sufficient distinction to remove this species to another genus. The *tout ensemble*, however, of the shell is so very Spathoid that I prefer temporarily to locate it in that genus.

16. *UNIO NILOTICUS*, Cailliaud, Voy. à Meroë, vol. ii. pl. 61. f. 8, 9; Küster, Conch. Cab. pl. 45. f. 5, narrow var.; Reeve's Conch. Icon. f. 374.

*U. parreyssii*, Bush, Philippi's Abbild. vol. iii. pl. 5. f. 6.

The specimens from Lake Tanganyika agree very well with this species. The form is subject to considerable variation, some specimens exhibiting a much more decided upper angulation at the posterior end, and having the curve of the lower margin different. The internal nacre also varies in colour, the general tone being whitish faintly tinged with a rosy blush. Two odd valves, however, are of a beautiful salmon tint.

#### 17. *UNIO TANGANYICENSIS*. (Plate XXXI. figs. 9, 9 a.)

Shell small, ovate, posteriorly acuminate, thickish, concentrically striated, and more or less corrugated in the anterior or lunular region, straw-colour, closely and finely rayed with bright green; anterior end regularly curved, forming an obtuse angle with the dorsal line; ventral margin also much arcuated, feebly sinuated posteriorly, where the valves are rather acuminate; posterior dorsal slope obliquely arcuate. Umbones slightly wrinkled at the apex and pearly. Valves with a narrow defined lunule anteriorly, and a shallow depression on the posterior side near the border. Hinge composed of comparatively fine roughened or striated teeth. Muscular scars irregularly rounded, anterior one deepest. Nacre generally of a purplish liver-colour, sometimes whitish and indistinctly rayed with pink, and rarely salmon-tinted. Length 17 millims., width 24, diam. 11.

This is a very pretty little species, and remarkable on account of the vivid radiating green lines. The corrugation on the anterior end is somewhat granular in character. This wrinkling is only feebly expressed at the very apex of the umbones, and also slightly posterior to them.



18. *Ætheria elliptica*, Lamarck, Annales du Mus. 1808, vol. x. pl. 29 and pl. 31. f. 1; Blainville, Malacol. pl. 70 bis, f. 2; Sowerby, Conch. Icon. f. 1 *a*, *b*.

A single old thick dead specimen forms part of the collection.

In addition to the preceding, the collection contains a species of *Perideris*, but too immature for identification, a third species of *Ennea*, and a *Physa*, both being in a very decayed state.

#### EXPLANATION OF PLATE XXXI.

- Fig. 1, 1 *a*. *Achatina* (*Limicolaria*) *martensiana*, p. 345.  
 2. — (—) *rectistrigata*, p. 346.  
 3. *Bulimus* (*Buliminus*) *ptychaxis*, p. 346.  
 4. *Ennea lata*, p. 347.  
 4 *a*. Ditto (young state), p. 347.  
 5. *Ennea wijiensis*, p. 347.  
 6, 6 *a*, 6 *b*. *Typhobia korei*, p. 348.  
 7, 7 *a*, 7 *b*, 7 *c*. *Neothauma tanganyicense*, p. 349.  
 8, 8 *a*. *Spatha tanganyicensis*, p. 350.  
 9, 9 *a*. *Unio tanganyicensis*, p. 351.

5. On the External and Structural Characters of the Male *Spirula australis*, Lam. By Prof. OWEN, C.B., F.R.S., F.Z.S., &c.

[Received April 7, 1880.]

#### (Plate XXXII.)

The subject of the present observations<sup>1</sup> is rather larger than the female specimen of *Spirula australis*, described and figured in the 'Annals and Magazine of Natural History,' series 5, vol. iii. p. 1, pl. i. fig. 1 (1879), and in the 'Proceedings of the Zoological Society,' 1878, p. 964, pl. lx. fig. 4.

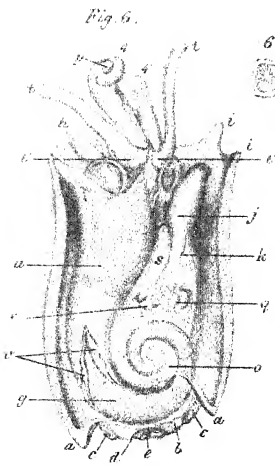
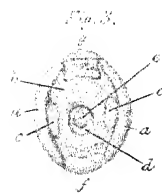
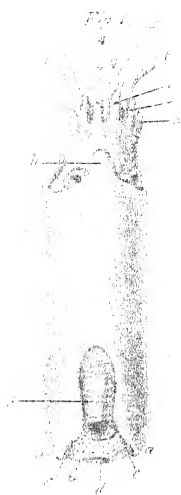
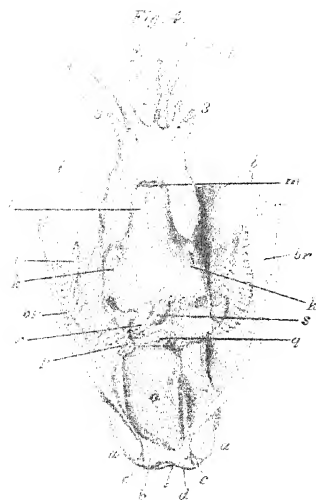
The body-envelope, or mantle, has the same thickness and muscular development: its terminal modifications for attachment are closely repeated; they are represented of the natural size in Plate XXXII. fig. 3, in which are shown:—*a*, *a*, the terminal pallial lobes; *b*, the fleshy cushion; *c*, *c*, the rudimental or *quasi* fins; *d*, the succtorial cavity; *e*, its central pore; *f* the ventral portion, *g* the dorsal portion, of shell—both which are naturally exposed, but are immediately invested by the shell-membrane, capsule, or sheath<sup>2</sup>.

The surface of the mantle is smooth, without trace of the reticular markings characteristic of that of *Spirula reticulata*<sup>3</sup>. The anterior border of the mantle sends forward the median dorsal process (Plate XXXII. fig. 1, *h*) and the pair of ventral sublateral processes (*ib.* fig. 2, *i*, *i*): the former is the longer and larger; and all terminate obtusely. The funnel (fig. 4, *j*) would project, when not retracted as in the specimen (fig. 2) between the ventral processes. The in-

<sup>1</sup> This specimen was purchased for the British Museum with other objects of Natural History, said by the vendor to have been obtained during the voyage of 'La Bonite:' the locality of the capture of the *Spirula* was not known to him.

<sup>2</sup> Compare with the enlarged view, 'Annals,' &c. *tom. cit.*, pl. i. fig. 3.

<sup>3</sup> 'Zoology of the Voyage of H.M.S. 'Samarang,' 4to, 1848, pl. iv. figs. 3, 9, 11.



Borjeau del. Smit lith.

Hanhart imp.



fundibular characters of the female *Spirula* ('Annals,' &c., p. 4) are repeated in the male, as, for example, the long, narrow, articular cavities (Plate XXXII. fig. 4, *k*) receiving the corresponding prominences (*ib.* *l*) on the juxtaposed inner surface of the mantle, and the small terminal valvular aperture (*m*).

The chief sexual modifications affect, as usual, the brachial part of the head.

The three pairs of the ordinary arms (Plate XXXII. figs. 1 and 5, 1, 2, 3) spring from little more than the dorsal half (fig. 5) of the brachiophorous part of the head. The ventral portion (fig. 6) is mainly occupied by the expanded bases (*t*, *t'*) of the tentacles (*t*), which form oblique cavities, or short sheaths, lodging the modified ventral (4th) pair of arms (*ib.* 4, 4').

The specimen here described presented at first view, from the ventral aspect, a single clavate process (*ib.* fig. 2, 4) in the place, apparently, of the fourth pair of arms—the process ascending for a length of 10 millims. between the bases of the tentacles (*t*), and its own base being united by a pair of short webs to those of the arms of the 3rd pair (*ib.* 3, 3).

From the dorsal aspect of the specimen (*ib.* fig. 1) the clavate process, 4, presented a longitudinal cleft near one side, marking off the portion 4' (fig. 6).

Divaricating this portion, it was seen to be a distinct though smaller clavate process (fig. 4, 4'), compactly adherent to, but not organically connected with, the larger one, though springing in close contiguity therewith, from the ventral brachiophorous portion of the head (*ib.* fig. 6, 4, 4'). It was now plain that these clavate processes were the sexually modified homologues of the 4th pair of ordinary arms in other Cephalopods. Each was subquadrate in shape, the side of the longer process lodging the shorter one, being hollowed to receive it. The end of the shorter process (4') was truncate, as if a part had been broken off; that of the longer process was rather enlarged, terminating obtusely, and supporting a small accessory protuberance (fig. 6, 4, *p*).

Longitudinal and transverse sections displayed a solid fibrous tissue in each: the fibrillæ of the smooth-muscular type were arranged in a thin outer layer of transverse fibres, and, in a larger proportion, of inner longitudinal fasciculi, offering in transverse section the radiate arrangement shown in fig. 6 *a*. No trace of acetabula could be detected on any part of the superficies of these modified brachia. Each, viewed from the ventral aspect, as in fig. 6, rose out of the shallow cavity or short sheath formed by an expansion of the base of each contiguous tentacle (*t*, *t*). Of each of the tentacles a basal portion only is preserved.

The dorsal division of the arm-bearing part of the head (*ib.* fig. 5) lodged in its ventral concavity the beak with its surrounding lips, *m*, more definitely so located than in the female (*op. cit.* pl. i. fig. 5), but presenting a similar structure.

The arms, 1, 2, 3, were shorter, thicker, and more obtusely terminated than in the female; and only with a magnifying power (not

at all needed with the female) were traces of acetabula visible (fig. 5, *a*): these were merely sessile cupules, not manifesting the peduncular attachment and special structure exhibited in the 'Annals,' pl. i. fig. 6, *d, e*. The longest, or least-curtailed, of the arms showed a small prominence (fig. 5, *a, a*) on each side of the base of the hemispheric termination (*b*).

The testis (fig. 4, *o*) is a large oblong body, flattened on the ventral (peripheral) side, and extending irregularly centrad into the interspaces of the shell-whorls (fig. 6, *o*). A long, slender, convolute sperm-duct (vas deferens, fig. 4, *p*) conducts the spermatozoa to a wider folded canal with glandular walls (*ib. q*), which communicates with a cæcal prostate, opening into an elongate spermatophorous pouch (*r*). From this a short duct leads to a fleshy hollow penis (*ib. s*) about 6 millims. in length.

The arms which are sexually modified for copulatory actions are the same (viz. the fourth or ventral pair) which are the seat of such adaptation in *Sepia* and *Loligo*<sup>1</sup>. But, instead of being "hectocotylized," the "brachia copulatores" have lost all trace of acetabular organization in *Spirula*. The other ordinary arms (1, 2, 3) moreover have that characteristic part of their structure reduced to the rudimental condition in the copulatory arms of *Sepia inermis*<sup>2</sup>, and in a portion of one of those of the male *Sepia officinalis*<sup>3</sup>.

The structures of the digestive, circulating, respiratory (Plate XXXII. fig. 4, *br*), excretory (hepatic, renal, and melanine), nervous, and muscular systems are identical, or in close accordance with those shown by the female subject of the anatomy of *Spirula* detailed in the 'Annals' (*loc. cit.*). In fig. 6 of the present communication a view is given of the outward relations of the shell to its muscular and fascial attachments. The disposition of the enveloping portions or origins of the mass of "retractores capitis infundibulique" from the terminal chambers is shown at *u*, fig. 6; the thin but firm, glistening, fascial investment (*v*) of the shell is represented as partially reflected therefrom.

#### EXPLANATION OF PLATE XXXII.

##### *Spirula australis* ♂.

Fig. 1. Dorsal view.

2. Ventral view.

3. Terminal surface of the body.

4. Visceral chamber laid open along the ventral side, showing the gills and male organs *in situ*, with the funnel.

5. An inner view of the three pairs, 1, 2, 3, of arms and of the mouth, *m*.

5'. The same surface of the terminal portion of the arm, 1, showing the acetabular modification, magnified.

6. A dissection showing the shell, with its muscular and fascial investments, and the "brachia copulatoria," 4, 4'.

6 a. Transverse section of the larger "brachium copulatorium."

(All the figures, save 5', are of the natural size; the letters of reference are explained in the text.)

<sup>1</sup> Steenstrup (Prof. Joh. Japetus Sm.) "Hectocotyldannelsen hos Octopodslægterne *Argonauta* og *Tremoctopus*," &c., 'Kongelige Danske Videnskabernes Selskabs Skrifter, 5te Række, 4de Bind,' 4to, 1856, p. 28, tab. i. figs. 1-9.

<sup>2</sup> *Loc. cit.* tab. i. fig. 8.

<sup>3</sup> *Ib. ib.* fig. 7.

May 4, 1880.

Prof. W. H. Flower, LL.D., F.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of April 1880 :—

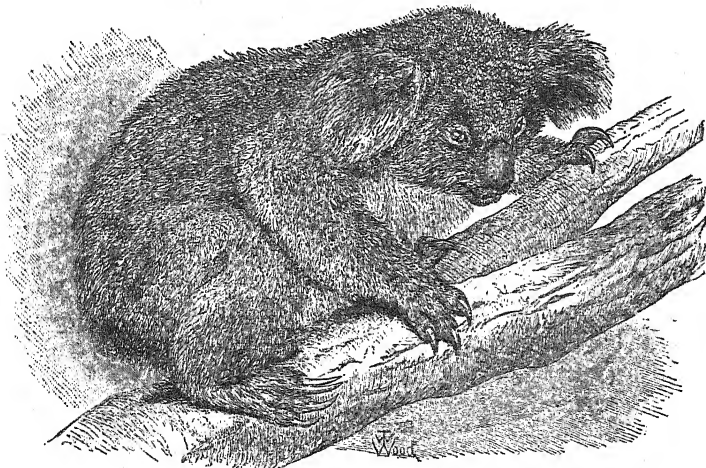
The total number of registered additions to the Society's Menagerie during the month of April was 82, of which 33 were by presentation, 5 by birth, 36 by purchase, 7 were received on deposit, and 1 in exchange. The total number of departures during the same period, by death and removals, was 69.

The most noticeable additions during the month of April were as follows :—

1. An example of the Short-toed Perameles (*Perameles obesula*, Gould's Mammals of Australia, vol. i. pl. 12), purchased April 15th, being the first example of this Marsupial which we have received for the Menagerie.

2. A young male Cape Hunting-dog (*Lycan pictus*), presented by C. Ernest Pope, Esq., of Alice, Victoria East, South Africa, and received April 19th. Mr. Pope informs me, writing on March 1st, that the specimen was then, he believed, about ten months old, and had been fed almost entirely upon the small intestines of sheep. It had been captured when quite young and brought up with some Pointer puppies, with whom it had lived on familiar terms. The only previous example of this animal received by the Society of late years was that acquired in 1871 (see P. Z. S. 1871, p. 298).

3. A Koala or native Bear of Australia (*Phascolarctus cinereus*),



Koala, reduced from a drawing by Mr. T. W. Wood, F.Z.S., published in 'The Field' of May 22nd, 1880.

purchased April 28, being the first example of this peculiar Marsu-  
Proc. Zool. Soc.—1880, No. XXIV. 24

pial that has been brought alive to Europe. Many attempts have been made by the friends and correspondents of the Society in Australia to induce specimens of this animal to live in captivity; but all have hitherto failed. The present example, which was purchased of a dealer in London, was brought home fed upon dried leaves of *Eucalyptus*, and had been several weeks in this country before it was acquired by the Society.

I also take this opportunity of calling attention to the fine Toucan, brought from the State of Tolima, U. S. of Colombia, and presented to the Society by Mr. L. Merino on the 26th of August 1826, and still living in the Parrot-house. This Toucan was correctly entered in the list of additions in 1876 (P. Z. S. 1876, p. 834) as *Ramphastos ambiguus*, but in the last edition of the List of Animals (1879, p. 258) was unfortunately referred to *R. tocard*, a closely allied but perfectly distinct species.

*R. ambiguus* is readily recognizable, as will be seen by the coloured drawing of the head which I now exhibit, by the black colour of the lower and of the base of the upper mandible, where in *R. tocard* there is a large reddish blotch. This is well shown in Mr. Gould's plates (Ramph. ed. 2, pls. iv. & v.); but the naked space round the eye in *R. ambiguus*, which is there coloured blue, should be of a pale yellowish green.

Mr. Sclater exhibited a specimen of the Ibis (*Geronticus comatus*) obtained at Biledjik on the Euphrates by Mr. Danford in February 1879 (as mentioned by him in a recent number of 'The Ibis,' 1880, p. 88, and there referred to *Geronticus calvus*)—and made some remarks on its previously known distribution, which appeared to extend from Tangier on the west (Favier in Irby's 'Birds of Gibraltar,' p. 192) to Gomfuda upon the Arabian shore of the Red Sea (Hempr. & Ehr., in Rüppell's Syst. Ueb. p. 119). It was singular that the bird had not been hitherto obtained in Eastern Palestine, which it would apparently pass through on its northern migration.

Dr. Günther informed the meeting that he had received another communication from the Rev. G. Gordon with respect to the occurrence of *Holacanthus tricolor*<sup>1</sup> in the Western Isles. His correspondent had made further personal inquiries at Lossiemouth, from which it appeared that the specimen was brought from Stornoway to Lossiemouth, that it had been carried to "Stornoway by the master of a small ship that had come from Glasgow, and that the fish had not been caught at Stornoway by a herring-net or otherwise." Under these circumstances it could not be held that this specimen had been caught on the British shores.

Prof. F. Jeffrey Bell exhibited an immature specimen of an Echinoid belonging to the Edinburgh Museum of Science and Art, and made the following remarks:—

The specimen which I have now the honour of exhibiting to the

<sup>1</sup> P. Z. S. 1880, p. 23.

Society, is the one to which I referred to in my description of *Palæolampas crassa*<sup>1</sup> as being under the charge of Dr. Traquair, in the Museum of Science and Art at Edinburgh. Dr. Traquair has just arrived in London, and early this morning was good enough to bring me the specimen to the British Museum.

I have examined it with considerable interest and profit; but I do not find myself able to place it in the new genus *Palæolampas*; it is, I suspect, a comparatively young example of some species of the genus *Echinolampas*, or, possibly, of *Conoclypeus*. The following are its more important characters and measurements:—

Length 33·3 millims., height 17 millims. Test very delicate. The actinal and anal orifices, which have lost all covering-plates, are of proportionally large size; the former is without bourrelets, but is provided with well-developed tubercles. When we compare it with *Echinolampas*, we find that the characters of the actinostome are already as well defined as in *E. depressa*, and we see, moreover, the probability of the young form undergoing some further modification, such as would in all likelihood bring it, when adult, into very close resemblance to *E. oviformis* (cf. especially var. *orientalis* of Gray). So, again, the irregularly cordiform anus is not so large even in this younger state as it is in *E. depressa*, while its proportionally greater size than in an adult *E. oviformis* is only what we should expect.

The apical pole is a little anterior to the geometrical centre of the upper surface, and is not at the highest point of the test.

Coming next to the point which indicates that this creature belongs to a race which is more highly specialized than *Palæolampas*, we find that its affinities to *Echinolampas oviformis* are here, again, not obscurely indicated: there is not, indeed, the same difference, as in the adult, between the lengths of the rows of the pores of the same area; but they all cease to exhibit the regular paired arrangement of the rows of pores at a considerable distance from the ambitus; the odd anterior ambulacrum ends at 8 millims. above the ambitus; of the antero-lateral the left is a little longer, and the right is a little shorter than the odd one; the postero-lateral are, as in the allied forms, a little longer; and the paired character of the rows of ambulacral pores ceases somewhat more gradually. The pores are rounded; and there is no slit-like enlargement of one, such as is to be seen in *P. crassa* or *E. depressa*. As in *E. oviformis*, there is a delicate ridge separating every pair of pores from its neighbour; and we have therefore the pores in grooves.

If these points are not sufficient to show that the specimen from the Edinburgh collection is more highly differentiated than *Palæolampas*, I may add two other facts:—

(1) Save for about a third of the actinal surface, around the actinostome, the ambulacral pores on that surface are exceedingly rare, rarer even than in the adult *E. depressa*.

(2) The primary tubercles are more distant than in *P. crassa*; and though, on the whole, still very regularly arranged, there is a

<sup>1</sup> P. Z. S. 1880, p. 43.



bare band of considerable extent, on the actinal surface, between the anus and the actinostome. This is more marked than any space on the actinal surface of *E. depressa*.

The final question as to the specific relationship of the form now under description appears to me to be one which lack of material prevents us from answering completely. The considerations which I now adduce, and a comparison of this specimen with the figure given by Prof. A. Agassiz of *E. depressa* (and of *Conoclypeus*) will prevent us from associating it with that species; it can hardly be, I think, a young specimen of *E. hellei*, if, indeed, that be a distinct species. Unfortunately we have no intermediate specimens, and Dr. Traquair has no information with regard to this one, which might help us to determine whether or no it be a young specimen of the widely distributed *E. oviformis*.

If such be not the case, it will be the young of some undescribed and unknown *Echinolampas*, with which, when found and described, there will, I hope, be associated the name of the eminent naturalist to whose kindness we owe the present opportunity of inspecting this very interesting form.

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Mr. W. A. Forbes exhibited a small fragment of bone which had caused the death of a Leopard (*Felis pardus*) in the Society's Menagerie on April 20, under the following circumstances:—

For about a week previous to its death the animal, a fine adult male, had refused food, and, having been separated from its companions, was noticed by the keeper to be apparently suffering from some intestinal obstruction. The animal was in good condition and very fat. On opening the abdominal cavity after death, about a gallon of an opaque, dirty-red-coloured, chyly-looking fluid was found in it. There was a large clot of indurated fæces in the large intestine. In addition, near the commencement of the jejunum, was found a small bolus of straw that had been swallowed, as is often done by these animals in the absence of grass. In this a triangular splinter of bone, about  $1\frac{1}{2}$  inch long by 1 inch high, with a very sharp edge, had become impacted firmly, so much so as to perforate the walls of the intestine, and to project outside into the abdominal cavity for about  $\frac{1}{8}$  of an inch. The movements of the animal, or the peristaltic action of the intestines, had caused this sharply-projecting angle of the bone to cut through the intestinal walls for the distance of some 2 inches. Through this wound the juices of the stomach and intestinal canal, together with the fluid swallowed by the animal had apparently leaked, and had given rise to the accumulation of fluid in the abdominal cavity which had caused death.

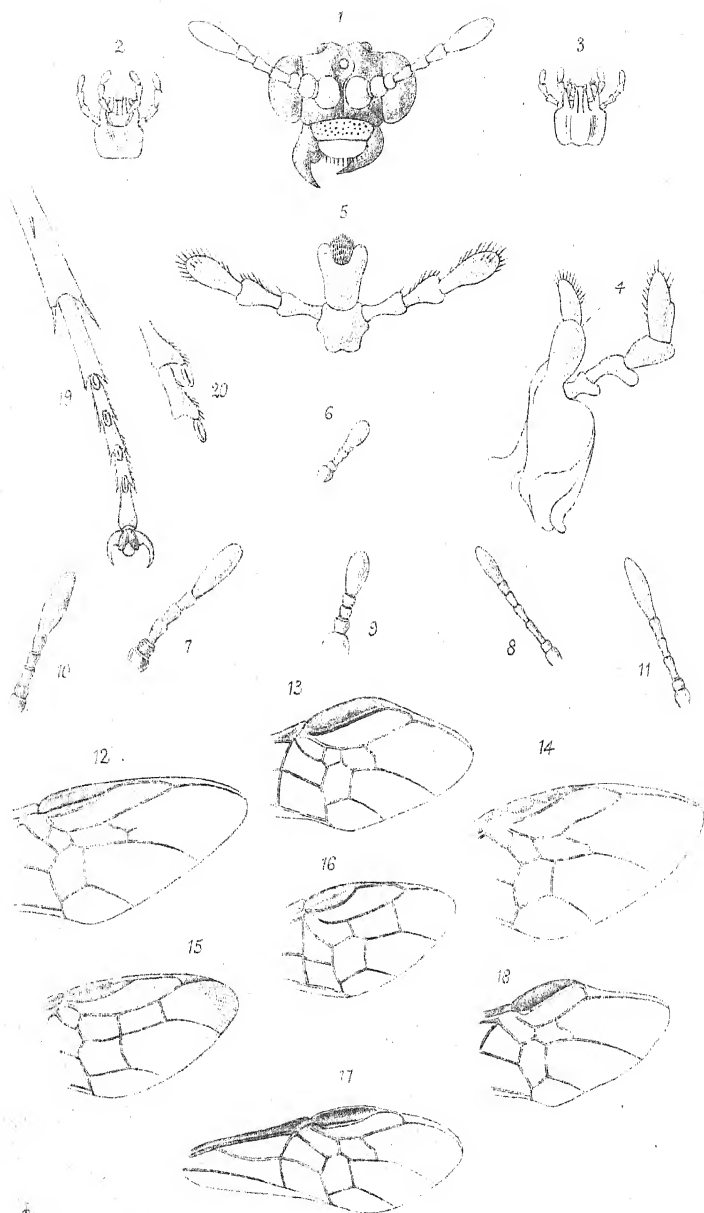
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Prof. Flower called the attention of the meeting to the fact that a young specimen of the Lesser Fin-Whale (*Balenoptera rostrata*), fifteen feet long, taken off the coast of Cornwall, was now being exhibited in London.

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The following papers were read:—



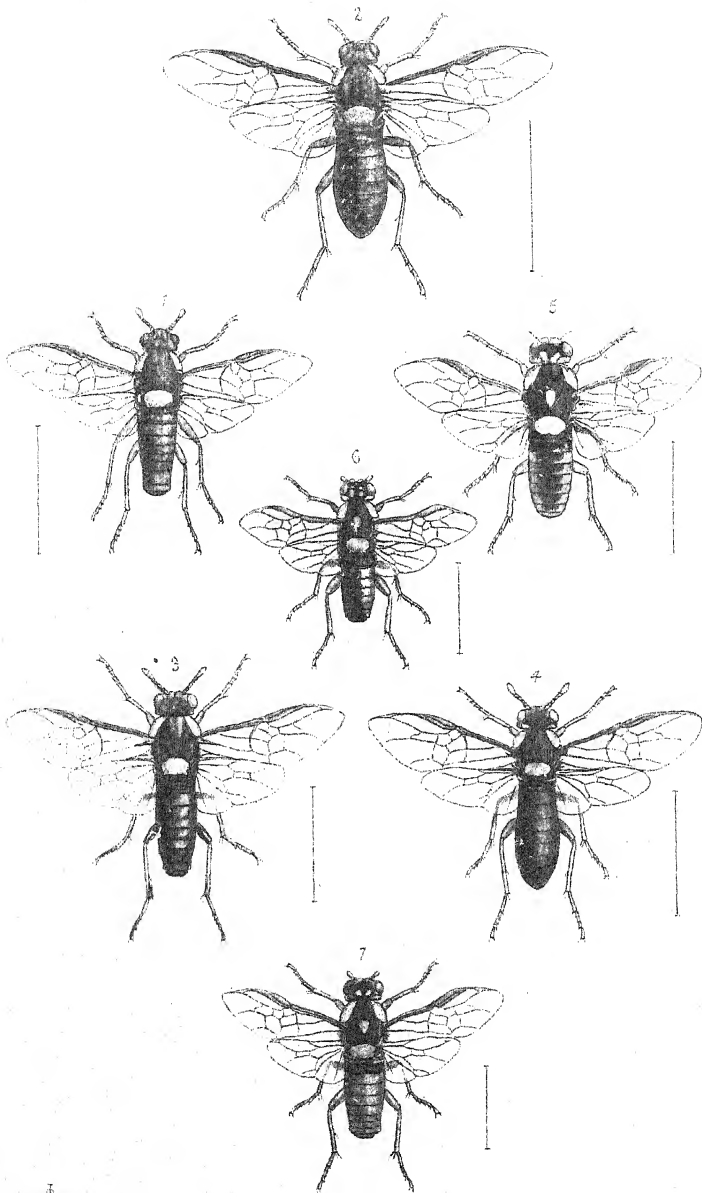


W. Parkes lith.

Harhart imp.

DETAILS OF AUSTRALIAN SPECIES OF PERIGA.



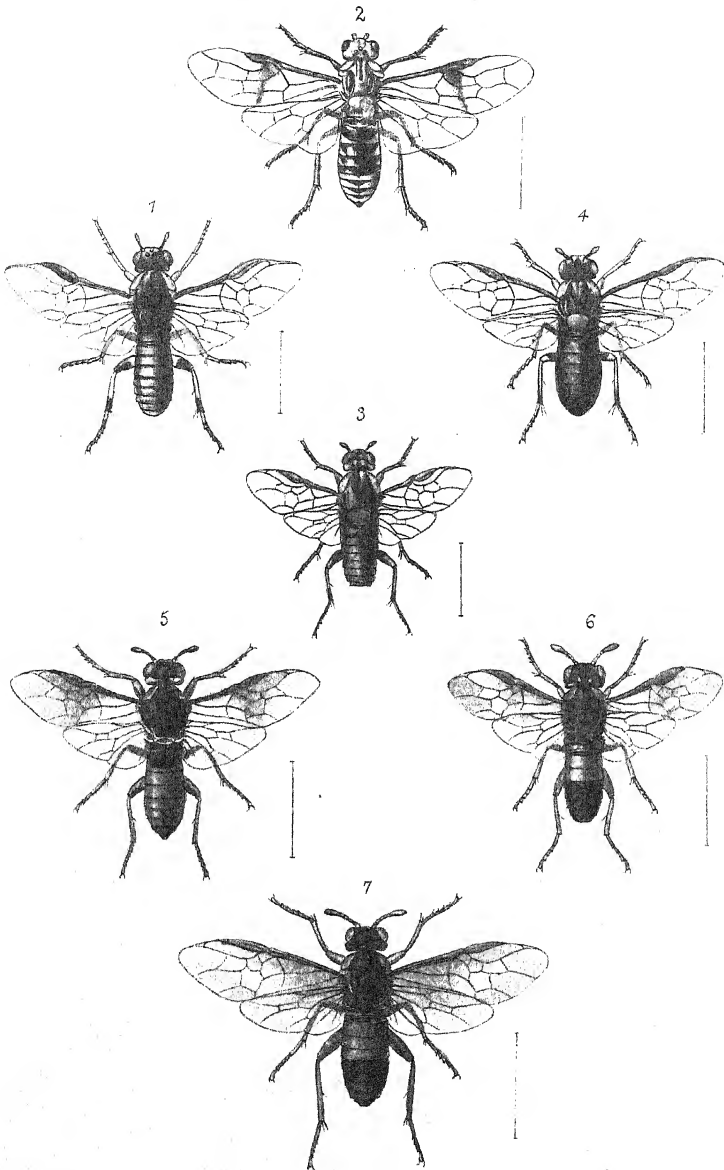


W. Purkiss lith.

Hanhart imp.

AUSTRALIAN SPECIES OF PERGA.





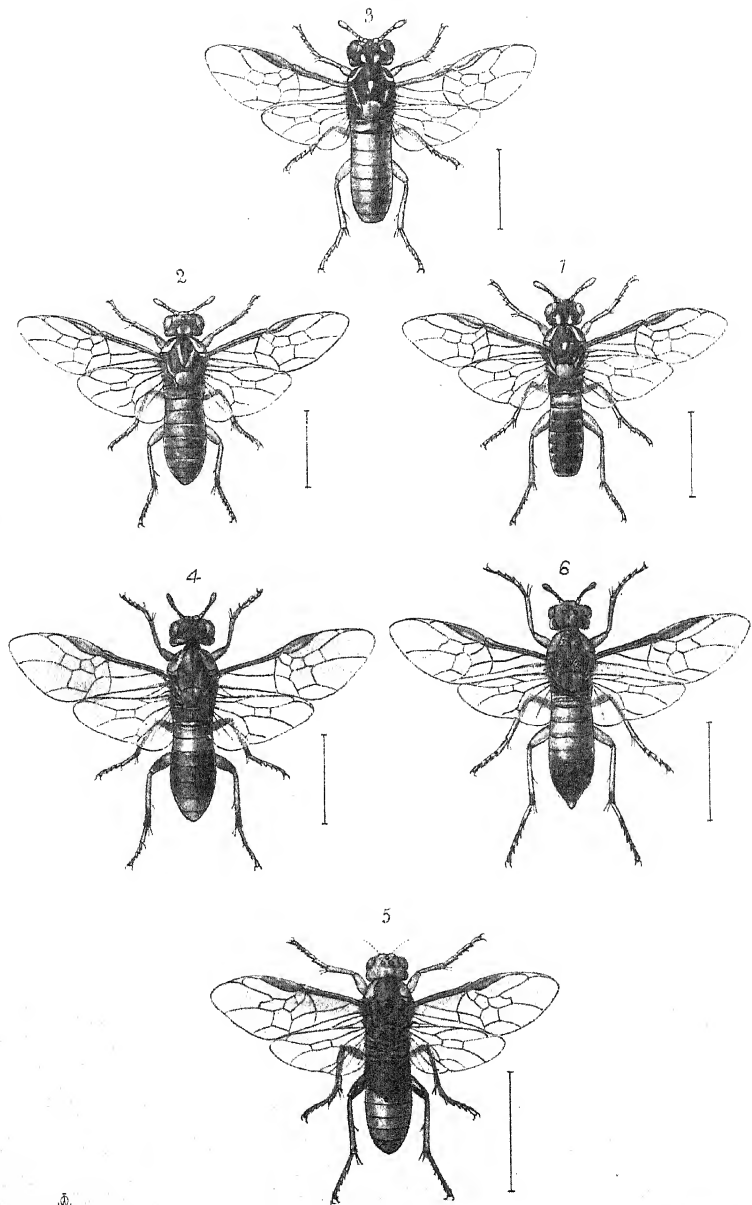
W. Perikiss lith.

Harthorst imp.

AUSTRALIAN SPECIES OF PERGA.





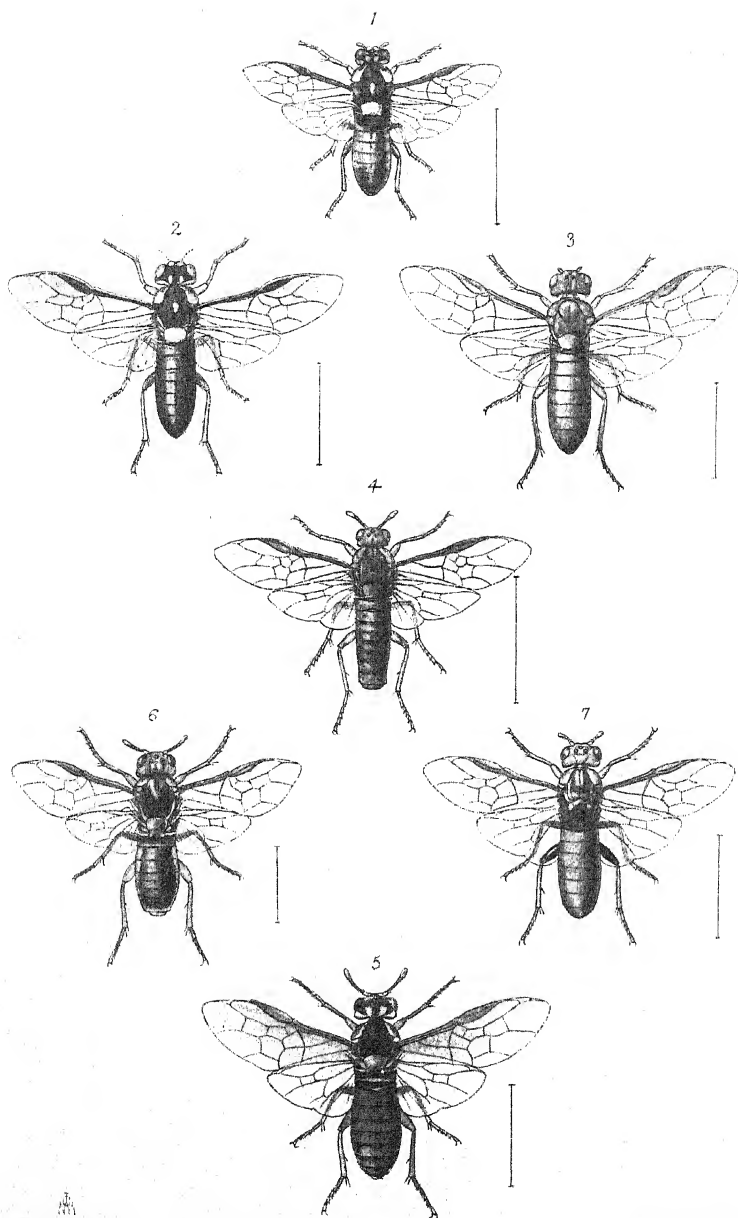


W. Purkiss lith.

Harshart imp

AUSTRALIAN SPECIES OF PERGA.





W. Purkiss lith.

Hanhart imp.

AUSTRALIAN SPECIES OF PERCA.

1. A Monograph of the Sawflies composing the Australian Genus *Perga* of Leach. By J. O. WESTWOOD, M.A., F.L.S., &c.

[Received March 16, 1880.]

(Plates XXXIII.—XXXVII.)

Family TENTHREDINIDÆ.

Genus PERGA, Leach, Zool. Miscell. iii. p. 115.

*Antennæ breves vel brevissimæ, 6-articulatæ (rarius 7-, rarissime 5-articulatæ), articulo ultimo clavam efformante. Labrum parvum, subsemicirculare. Clypeus distinctus, transversus, antice sæpe emarginatus. Mandibulæ validæ, arcuatæ, dimidio basali lato, in medio dente vel incisione parva angulata instructæ; apice acutæ. Palpi breves, subæquales, maxillares 4-articulati, labiales 3-articulati. Collare utrinque in squamam magnam lateralem productum. Alæ latæ, cellula unica marginali apice appendiculato, cellulisque 4 submarginalibus, stigmatibus magno, margine alarum anticarum pone stigma in maribus sæpe dilatato et oblique truncato; venulis inter cellulas marginales sæpe medio bullatis. Tibiæ 4; posticæ in medio lateris interni spinulæ armatæ, apiceque bicalcaratæ, calcaribus mediocribus acutis simplicibus.*

The fine species of this genus are natives of Australasia, where they represent the *Cimbeces* of the northern hemisphere. They are represented also in South America by the species of the genus *Pachylosticta*, which, both in their metallic colours and the curious structure of the dilated fore wings, offer a complete analogy to the *Pergæ*.

With the exception of the *Cimbeces*, they are the largest known species of Sawflies; and several of the species even rival the larger species of *Cimbex* (which are the giants of the family) in size.

The antennæ are very short and clavate, in a few of the species scarcely extending as far as the eyes; they are inserted on the outer margins of two frontal tubercles. In one species they are even deficient of one of the intervening joints, being only 5-jointed (*Perga mayrii*), whilst in several of the species (*P. leachii*, *jurinei*, and *halidaii*) the basal portion of the terminal clavate joint is distinctly articulated, making the organ 7-jointed. I have not thought it advisable to separate these species generically from the rest.

The *mouth* of the species in this genus offers some peculiarities hitherto not noticed. The mandibles are strong and horny, the apical half curved and acute at the tip, the basal portion flattened, terminating on the inner edge in a deep simple incision. The maxillæ and labium, with the palpi, are short and united into a mass by basal membrane, as shown in Plate XXXIII. figs. 2 and 3—the inner lining (fig. 3), and also apparently the outer connecting skin of these organs being apparently continuous and not exhibiting any

articulation. This structure appears to be nearly similar to that observed in some Neuroptera, as in *Panorpa*—the mentum sitting upon the conjoined membrane of the inner margins of the basal portions of the maxillæ. These parts being comparatively short, are incapable of being folded back as in the *Cimbece*s, and consequently lie flat when at rest; the diminished size affects the palpi, which are all nearly alike in their dimensions, the maxillary pair having only four joints, and the labial pair three—characters which have hitherto remained unnoticed, by which they are distinguished from all the other genera of Tenthredinidæ, which, as shown by Curtis (Brit. Entom.), have 6-jointed maxillary and 4-jointed labial palpi.

The middle portion of the thorax (mesonotum) is, in many of the species, marked with an impressed longitudinal canal extending from the front margin halfway to the great scutellum.

There are also two deep impressed lines extending from the middle of the inner margin of the dilated lobes of the collar, converging in the centre of the back and forming a sharp angle, which is often preceded by a hastate spot of a pale colour; the sides of the mesonotum are also often longitudinally raised, the lateral margins being also acute and parallel. The scutellum is of large size, generally pale-coloured, and furnished at each of its posterior angles with a small projecting tubercle. This scutellum is followed by a joint which is clearly the representative of the metanotum (Comp. my Introd. Mod. Class. Ins. ii. p. 115, figs. 2 & 3, s), and not the basal segment of the abdomen, from which it is generally separated by a distinct narrow membrane which is not seen to exist between the true segments of the abdomen.

The abdomen of the males is generally short and truncate at the tips, and often setose on the upper surface, the setæ or sericeous covering in one species (*P. dorsalis*, Leach) being so dense as to give a distinct colour to the dorsal patch.

The wings are large or of moderate size, those of the males being smaller than those of the females; in the former, moreover, the stigma of the fore wing is large, and the anterior margin of the wing beyond the stigma is, in some species, obliquely truncate, giving quite a distorted appearance to the wing. This character was employed by Leach for one of his sections of the genus; but, being merely sexual, it is inadmissible for such a purpose. The transverse veinlets between the submarginal cells are often partially obliterated or bullated in the middle, the first being in a few species either quite lost or only partially indicated, upon which character (as seen in *P. lewisii* &c.) M. Guérin-Ménéville proposed to form a separate subgenus; but there is no clear line of demarcation in the species in this respect. The shape of the cells of the fore wings affords good specific characters. The marginal cell is always furnished at its extremity with a slender veinlet extending to the tip of the wing, the extremity of the cell itself being at a greater or less distance from the extremity of the stigma, the tip of the cell being sometimes quite acute and sometimes obtuse. The shape also of the third submarginal cell is also varied in consequence of the direc-

tion of the cross veinlet at its extremity, which is sometimes quite straight, in others much curved; in one species it is sharply angulated in the middle (*P. walkeri*); and in another species (*P. schiodtei*) the female has occasionally a small supplemental spur, extending from the middle of this angulated cross veinlet. The closed cells vary in their extent, sometimes scarcely extending beyond the stigma and sometimes reaching nearly to the hind margin of the wings.

The legs are generally rather short, especially in the males, in which sex they are thickened. The tarsi vary considerably in length, being generally shorter than the tibiæ; but in the females of *P. lewisii*, as well as in other species, the tarsi are more elongated, with the joints flattened and the cushion on the underside more developed.

Dr. Leach divided the genus into as many sections as the species with which he was acquainted, employing the antennæ and wing-cells as characteristic of his groups, which were as follows:—

- A. Alis anticis ante areolam marginalem non prominentibus (antennis articulo tertio duobus sequentibus longiore).
  - a. Areolis submarginalibus duabus primis confluentibus, ultima ad basin superne subacuminata; areola marginali elongata, antice et postice acuminata ..... Sp. 1. *P. polita*.
  - b. Areolis submarginalibus perfectis, ultima basi arcuato-emarginata; areola marginali elongata, antice et postice acuminata..... Sp. 2. *P. bicolor*.
  - c. Areolis submarginalibus perfectis, ultima basi recta; areola marginali ovata..... Sp. 3. *P. latreillii*.
- B. Alæ anticæ ante areolam marginalem prominens (areola submarginali ultima basi superne acuminata).
  - a. Areola marginali ovata; antennis articulo tertio duobus sequentibus longiore ..... Sp. 4. *P. dorsalis*.
  - b. Areola marginali elongata angusta utrinque (postice præsertim) acuminata; antennis articulis tertia et quarto subæqualibus, tertio longiore, articulo quinto præcedente brevior..... Sp. 5. *P. kirbii*.
  - c. Areola marginali fere lineari, antice obtusa postice acutiuscula, antennis articulis tertio, quarto, et quinto fere æqualibus ..... Sp. 6. *P. ferruginea*.

I have not thought it necessary to carry out this principle of subdivision into the numerous species now known of the genus, which would have required a formidable tabulation of the specific distinctions of the insects with their sectional characters. Neither have I thought it necessary to adopt the subgenus *Pseudoperga*, proposed by M. Guérin-Méneville (in the text of the 'Iconographie du Règne Animal, Ins.,' p. 395) for *P. lewisii* on account of the first and second submarginal cells being confluent by the almost obsolete condition of the transverse veinlet separating them in the ordinary species.

Details of the natural history of two of the species, *P. dorsalis* and *P. lewisii*, have been recorded, condensed abstracts of which will

be found added to the technical specific descriptions of these two insects.

Many of the species are remarkable for metallic colours, which are of rare occurrence in the majority of the species of the family to which they belong.

### 1. PERGA DORSALIS.

*Perga dorsalis*, Leach, Zool. Misc. iii. p. 117, ♂.

♀. *Perga scutellata*, Westw. in Griffith's Anim. Kingd. Ins. pl. 76. fig. 2, and pl. 106. fig. 3, vol. ii. pp. 402, 792.

"*P. cæruleo-chalybeata*; clypeo, labro, antennis, pleuris macula triangulari, thoracis angulis anticis, scutello pedibusque subferrugineo-luteis, abdomine supra macula magna quadrata sericea flavida externe serrata; alis fulvescentibus, pterygosteorum margine stigmatum ferrugineis; mandibula luteo-ferrugineæ, latere interno nigricantes. Variat femoribus posticis apice nigris; abdomen postice subangustatum. Fœmina latet. Long. corp.  $10\frac{1}{2}$ , exp. alar.  $21\frac{1}{2}$  lin." (Leach.)

*Species permagna, maris abdomine macula magna quadrata sericea (segmenta media dorsalia occupante), alisque anticis stigmatum magno, margine antico pone stigma oblique subtruncato; scutello in mare plano, in fœmina macula transversa breviori albida notato; abdomineque supra viridi-cæneo subnitido.*

*Hab.* in Australasia (Moreton Bay &c.). In Mus. Hopeiano plurima individua utriusque sexus.

The details of the structure of the female published from my drawings in Griffith's 'Animal Kingdom,' pl. 106, were copied by Guérin-Ménéville in his 'Iconographie du Règne Animal, Insectes,' pl. 64. fig. 2. Another figure of the female was published by Brullé ('Hist. Nat. Ins. Hym.' iv. pl. 48. fig. 1, p. 674) under the name of *Perga scutellata*, Leach.

An account of the habits of this species, under the name of *Perga eucalypti*, was published by Messrs. Bennett and Scott in Proc. Zool. Soc. 1859, p. 209, (Annulosa) pl. 62, with figures of the larvæ and of the female insect.

The larvæ were found living gregariously on the leaves of *Eucalyptus citriodora* and other species, as well as upon *Callistemon*, which they rapidly destroy. The larvæ were huddled together both on the upper and under sides of the leaves, arranged, for the most part, in regular rows. When disturbed they bend their bodies in the form of an arch, and emit a greenish fluid from the mouth; they also emitted so powerful an odour of the leaves on which they had been feeding as to scent the room in which they were placed. When full-grown they are from  $2-2\frac{1}{4}$  inches long, of a uniform velvety black, with numerous short, stiff white hairs, and with only six large squamous reddish feet, apparently being destitute of the fleshy prolegs so common in the larvæ of Tenthredinidæ. When feeding, they keep the abdominal portion of their bodies in motion, rapping their extremities against the leaves. They bury themselves underground in October, forming brownish cocoons of

a very strong texture; and the perfect insect appears in the following March.

From the accompanying figures the larvæ have the body gradually attenuated behind, terminating in a sharp point, which they seem to use as a prehensile organ. On the edge of the leaf inhabited by the larvæ are represented several oval black objects emitting white bristles, which are not described in the memoir, and which may possibly be intended for excrement or cast skins of the larvæ.

## 2. PERGA KLUGII, sp. nov. (Plate XXXIV. figs. 1, 2.)

*P. politæ* (Leach) *affinis, fulvo-castanea, mesonoti medio absque macula flava, scutello flavo vix longitudinaliter impresso.*

*Mas.* Clypeo recte transverso; labro, tuberculis antenniferis antennisque fulvis; vertice vix longitudinaliter impresso, prominentiis duabus in medio parum distinctioribus; antennis ultra oculos extensis, articulis tribus intermediis gracilibus fere æqualibus; thorace magno, collaris lobis pallide flavis vage punctatis; mesonoto punctatissimo, linea tenui media antice impressa, lateribus parallelis, a scuto mesonoti haud distincte separatis; scutello magno, plano, nitido, impunctato, fulvo, transverso-ovali, tuberculis duobus posticis distantibus, impressione media longitudinali vix distincta, margineque postico parum elevato; meso- et metapleuris rude punctatis, macula parva flavida notatis; abdomine toto fulvo-castaneo subnitido; corpore infra cum coxis et pedibus concoloribus, tibiis tarsisque pallidioribus, femoribus et apice tibiæ 2 posticarum interdum obscurioribus; alis hyalinis, parum fulvescentibus, venis stigmatæque fulvis, cellula prima submarginali parva, secunda paullo majore pentagonali, tertia magnitudine præcedentibus simul sumptis æquali, apice valde obliquo et curvato.

*Fœmina differt vertice magis distincte longitudinaliter impresso.*

*Long. corp.* ♂ lin. 9, ♀ lin. 10–11. *Expans. alar. antic.* ♂ lin. 18, ♀ lin. 18–23.

*Hab.* in Australasia (Albany &c.). In Mus. Hopeiano, &c.

## 3. PERGA POLITA.

*Perga polita*, Leach, Zool. Misc. iii. p. 115.

*P. brunneo-violascens, polita, nitens; thorace ferrugineo; disco maculis, squamis, pleuris, scutello, capile, antennis, coxis, tibiis, tarsisque flavis, femoribus ventrequæ subviolascens-ferrugineis politis, stigmatibus postice albido notatis, alis fulvescentibus; pterygosteis, margine stigmatæque ferrugineis; mandibulæ saturate ferrugineæ latere interiore apiceque nigris; scutellum postice ferrugineo-brunneum.*

*Species magna, scutello fortiter canaliculato (charactere Leachio neglecto), alisque anticis pone stigma nonnihil saturatioribus facillime distinguenda.*

*Long. maris*  $\frac{2}{3}$  unc. *Expans. alar. antic.*  $1\frac{1}{4}$  unc.

*Hab.* in Terra Van Diemeni; Australia (e Dom. Macleao accepta), Hunter's River; Melbourne (Bakewell); Moreton Bay, and Gold Diggings. In Mus. Hop. Oxoniæ.



## 4. PERGA SCHIODTEI, sp. nov. (Plate XXXIV. figs. 3, 4.)

P. dorsali proxima at minor, maris alis aliter formatis, *fœmina cyanea nec virescens.*

Mas. Brunneo-castaneus, *cæruleo-nitens, abdominis apice rufo; fœmina capite et thorace cyaneo-nigris, abdomine cyaneo; mandibulis utriusque sexûs castaneis apice nigris; clypeo et labro flavis, tuberculis antenniferis subfulvis; antennis castaneis, articulis intermediis gracilibus subæquilongis, vertice linea media longitudinali impressa in fossulam rotundam ocelligeram antice terminata, lateribus verticis subplanis; collaris lobis flavidis punctatis; mesonoto antice oblongo-punctato, linea tenui media impressa, parte postica nitidissima cærulea, lateribus castaneis; scutello transverso-ovali, plano, impunctato, flavido, postice tuberculis duobus castaneis instructo; metanoto subcastaneo; abdominis dimidio basali cæruleo-nitido, apice castaneo-fulvo; thorace subtus impunctato, cum pedibus castaneo-fulvis, pleuris albidis grosse punctatis; pedibus fulvis, tibiis tarsisque pallidioribus, femoribus tibiisque duabus posticis apice nigricantibus; alis subhyalinis, costa, stigmatе venisque pallide brunneis, cellula prima et secunda submarginali fere equalibus, tertia duplo longiore, apice valde obliquo et curvato, margine antico pone stigma haud subito oblique truncato.*

*Fœmina differt colore obscuriore, nigricanti-cyaneo tincta, vertice absque linea media impressa, metanoto postice obscuriore, corpore toto infra cum coxis cyaneo nitido, mesopleuris valde rugosis cyaneis, nubila postica oblonga subfulva.*

Long. corp. ♂ lin. 8-8½, ♀ lin. 9. *Expans. alar. antic. lin. 16.*

*Hab. in Australasia, Adelaidam (Wilson). In Mus. Hopeiano Oxoniæ.*

## 5. PERGA BRULLEI, sp. nov. (Plate XXXIV. fig. 6.)

Mas. P. dorsali affinis, at dimidio minor, aliter coloratus, alisque anticis apice acute oblique truncatis; capite nigro, clypeo, labro, tuberculis duobus antenniferis, guttis duabus oratis verticalibus, margine postico oculorum et macula parva faciei utrinque inter oculos et antennis fulvis; antennis brevissimis, testaceis; mandibulis fulvis, dentibus nigris; collaris lateribus fulvis dilatatis, macula parva antice nigra; mesonoto macula parva hastata dorsali, tegulis linea tenui a scutello utrinque ad basin alarum ducta scutelloque fulvis, hoc glabro nitido semicirculari, punctis perpaucis lineaque media impressa fere obsoleta, tuberculisque duobus oblongis parvis instructo; abdomine parvo, luteo-testaceo, dorso cæneo setisque cinereis subsericante; mesosterno nigro nitido, valde convexo, pleuris macula magna oblonga, metapleurisque macula parva obcordata fulvis; pedibus basi nigro luteoque variis, femoribus quatuor posticis subtus ventreeque picco-nigris; pedibus fulvescentibus; alis infumatis, costa venis et stigmatе erasso obscurioribus, margine antico alarum pone stigma subito oblique truncato; cellula prima submarginali majore quam secunda.

Long. corp. lin. 6½. *Expans. alar. antic. lin. 13.*

*Hab. in Australia australiore. In Mus. Hopeiano Oxoniæ.*

## 6. PERGA VOLLENHOVII, sp. nov. (Plate XXXIV. fig. 5.)

Mas. *Capite angustiore quam thorax; thorace magno, oblongo, nitido; abdomine parvo, depresso sericeo; capite nigro, vertice parum cæneo; labro, clypeo, maculis duabus rotundis ad basin antenarum, maculis duabus oblongis inter has et oculos, lateribus capitis pone oculos maculisque duabus verticalibus obliquis pallide flavis; (antennæ detritæ;) mandibulis albidis, apicibus nigris; collaris lateribus late albidis (pone oculos nigro antice notatis); mesonoto nigro, subcæneo, nitido, parce punctato, macula trigona albidâ in medio dorsi; scutello magno, nitido, fere plano, albido, margine postico rotundato et tenuiter nigro; thorace subtilus nigro nitido, lateribus punctatis, meso- et metapleuris infra alas maculis duabus (postica minore) albidis notatis; coxis omnibus nigris nitidis; abdomine (multo minore quam thorax) supra fulvo, segmento basali omnino, reliquis dorso nigris, apice truncato; abdomine subtilus cum pedibus fulvis, his perbrevis; alis pallide luteo tinctis, costâ venisque magis luteis, stigmate magno castaneo, margine antico post stigma obliquo; cellula prima submarginali distincta, at luteo suffusa et quam secunda minore, tertie vena apicali obliqua et parum curvata.*

Long. corp. unc.  $\frac{2}{3}$  (lin. 8), thoracis dorsi lin. 4. Expans. alar. antic. unc.  $1\frac{1}{4}$ .

Hab. in Australasia. In Mus. Hopeiano Oxoniæ.

## 7. PERGA RITSEMEI, sp. nov. (Plate XXXIV. fig. 7.)

P. Vollenhovii proxima, sed multo minor et flavido magis colorata; capite nigro; labro, clypeo, mandibulis (dentibus nigris exceptis), macula trigona supra clypeum in medio canaliculato, maculis duabus rotundis in medio faciei cum aliis duabus intra orbitas oculorum, lateribus capitis pone et infra oculos maculisque duabus trigonis verticalibus flavis; antennis brevissimis, fulvis; collaris lateribus magnis flavis; mesonoto macula mediana acute trigona, lineis duabus gracilibus rectis lateralibus aliisque duabus obliquis a scutello ad basin alarum anticarum extensis, scutelloque semicirculari flavis, hoc utrinque versus angulos laterales posticos tuberculo parvo instructo; segmento basali abdominis supra cæneo, secundo linea basali transversa tenuissima nigra, reliquis segmentis cum pedibus brevibus fulvis; thorace subtilus nigro nitido, pleuris mesothoracis macula magna late triangulari flava (puncto nigro incluso), metathoracis gutta trigona flava; coxis 4 posticis et basi femorum subtilus piceis; alis pallidis, venis luteis, stigmate subcastaneo, cellulis submarginalibus parvis, prima majore quam secunda, margine antico alarum pone stigma obliquo.

Long. corp. lin. 6. Expans. alar. antic. lin. 12.

Hab. Adelaidam. In Mus. Hopeiano Oxoniæ.

## 8. PERGA ESENBECKII, sp. nov. (Plate XXXV. fig. 5.)

Fœmina. Nigra, nitida, punctata, flavido varia, abdomine supra

rufo, alis anticis ultra medium fuscis; labro et clypeo albidis, hoc tuberculis duobus minutis fuscis in medio, alterisque duobus oblongis in parte infera faciei, tuberculis duobus antenniferis albidis; antennis nigris, ultra oculos lateraliter extendentibus, articulo tertio dimidio longiore quam quartus; vertice nigro, bisulcato, sulcis in puncta duo fulva postice terminantibus; oculis postice et infra albedo marginatis; mandibulis fuscis, apice nigris; collaris lateribus albedo postice marginatis; mesonoto antice sulco in carinam acutam terminante sulcisque duobus obliquis postice conjunctis et ad scutellum extensis; hoc oblongo, sulcato, nigro, apice bituberculato albedoque marginato, angulis anticis lateralibus cum linea tenui obliqua lutea ad basin alarum extensa conjunctis; metanoto linea tenui lutea marginali ad basin posticam alarum posticarum extensa; abdomine sanguineo, nitido, segmentis duobus basalibus et apicali cæneo tinctis; mesopleuris lunula clavata marginali et metapleuris macula albidis notatis; abdomine infra nigro nitido; coxis et trochanteribus albidis, illis macula trigona nigra basali notatis; femoribus nigris, genibus tibiisque cum tarsis anticis fuscis, apice tibiæ infra fusco, tibiis posticis et tarsis brunneo-nigris; alis basi subhyalinis, venis et stigmate nigris, dimidio apicali anticarum (presertim sub stigmate) fuscis, cellula submarginali prima et secunda longitudine æqualibus, tertia duplo longiore, apice obliquo.

Long. corp. lin.  $6\frac{2}{3}$ . Expans. alar. antic. lin.  $13\frac{1}{2}$ .

Hab. Swan River. In Mus. Hopeiano Oxoniæ.

#### 9. PERGA GRAVENHORSTII, sp. nov. (Plate XXXV. fig. 7.)

*Fœmina.* Nigra, subopaca, rugosa, abdomine obscure fulvo-rufescente, segmentis 4°, 5° et 6° nigris, medio postice rufescentibus; capite nigro immaculato; clypeo et labro, mandibulis (dentibus nigris), pedibus antennisque obscure fulvis, harum articulis 3°, 4° et 5° fere æque longis; vertice bisulcato, linea transversa elevata a margine postico capitis separato; collaris lateribus piceo angustemarginatis; mesonoto antice sulco medio alterisque duobus postice acute conjunctis; scutello semiovali, sulco medio tuberculisque duobus posticis luteis instructo; metanoto et basi abdominis rufo-testaceis; hujus segmentis 4°, 5° et 6° supra nigris, macula trigona medio postico segmentorum relicta; coxis omnibus nigris nitidis; pleuris omnino nigris, punctatissime granulatis; abdomine subtilis piceo-rufo; alis magnis, obscure fulvis, anticis dimidio basali obscuriore, marginibus apicalibus cinerascentibus; venis et stigmate obscure fulvis, cellula tertia submarginali mediocri, suboblonga, apice recto at parum obliquo.

Long. corp. lin. 7. Expans. alar. lin.  $15\frac{1}{2}$ .

Hab. in Australasia. In Mus. Hopeiano Oxoniæ.

#### 10. PERGA CHRISTII, sp. nov. (Plate XXXVII. fig. 2.)

*Fœmina.* Nigra, nitida, punctata, albedo-varia, abdomine cæneo-cærulescente, pedibus albidis, femoribus apice nigris; alis basi hyalinis,

*pellucidis, dimidio apicali anticarum fusco; capite parum angustiore quam thorax, mandibulis nigris, labro et clypeo brevibus albidis, tuberculis duobus anticis magnis, orbita antica et postica oculorum guttisque duabus ovalibus verticalibus albidis; collaris lateribus nigris, albido late marginatis; mesonoto gutta media alteraque utrinque ad basin alarum, scutelloque transverso, fere oblongo-quadrato, albidis, hoc tuberculis duobus postice instructo; abdomine convexo, levissime punctato; mesopleuris fere impunctatis, macula oblonga, et metapleuris gutta, albidis; mesosterno nigro, convexo, glaberrimo; coxis et trochanteribus nigro luteoque variegatis; femoribus luteis, subtus et posticorum apice nigris; tibiis tarsisque luteo-albidis, illis subtus ad apicem linea fusca notatis; abdomine infra nigro nitido; alis fere hyalinis, dimidio apicali anticarum fuscis, venis stigmatum nigris, cellula secunda submarginali vix majore quam basalis, tertia ad apicem valde obliqua et curvata.*

*Hab.* Swan River. In Mus. Hopeiano Oxoniæ.

11. PERGA GUERINII, sp. nov. (Plate XXXV. fig. 1.)

*Mas. Antennæ totæ nigræ, singulatim in tuberculo parvo flavido insidentes; caput nigrum, lateribus pone et subtus oculos, clypeo integro labroque flavidis, mandibulis nigris; collaris lateribus flavidis, macula trigona media nigra; thoracis dorso nigro rugoso; prosterni marginibus, maculis duabus oblongis infra alas, pedibus cum coxis abdomineque subtus flavidis; femorum et tibiarum 2 posticorum dimidio apicali et annulis articularum tarsalium nigris; abdomine supra late chalybeio, sericante, segmento ultimo luteo; alis pallide brunneis, anticarum costa stigmatumque incrassatis fuscis, cellula prima submarginali oblitterata et in callositatem inter costam et stigma suffusa, margine antico alarum pone stigma oblique subtruncato et angustato.*

*P. ventrali (Guérin Mén.) affinis, at minor.*

*Long. corp. lin. 5½ (12 mill.).*

*Hab.* in Australia. In Mus. Hopeiano Oxoniæ.

12. PERGA CAMERONII, sp. nov. (Plate XXXVII. fig. 3.)

*Fœmina. Luteo-fulva, opaca, granulata, abdomine magis testaceo-fulvo, hujus apice, tibiis posticis et basi articuli primi tarsorum posticorum nigris; mandibulis apice nigris, antennarum articulis duobus basalibus brunneis; scutello concolori, apice tuberculis duobus ordinariis et denticulis duobus intermediis obtusis instructo; corpore infra cum pedibus luteo-albidis; tibiis 2 posticis (nisi basi) tarsorumque articulo basali (nisi apice) nigris; capite utrinque pone oculos et mesopleuris brunneis; alis fulvescentibus, dimidio apicali pallidioribus, apice extremo fusco, venis cum stigmatum fulvo-brunneis, cellula marginali apice ovali, cellula prima submarginali parva, tertia oblonga apice recte truncata.*

*Long. corp. ♀ lin. 6½. Expans. alar. antic. lin. 13.*

*Hab.* in Australasia. In Mus. Hopeiano Oxoniæ.

13. *PERGA FOERSTERI*, sp. nov. (Plate XXXVI. fig. 1.)

*Mas.* *Gracilis, opaca, nigra, flavo varia, abdomine fascia basali guttisque trigonis lateralibus fulvis, labro flavo, clypeo nigro fascia supera flava; tuberculis duobus antenniferis maculisque duabus oblongis ad marginem internum oculorum, horum orbita postico-laterali guttisque duabus verticalibus rotundis flavis; antennis fulvis, ultra oculos lateraliter extensis, articulis duobus basalibus nigris; mandibulis flavis, dentibus nigris; collaris lateribus flavis, antice nigris, macula parva discoidali et lateribus angustis mesonoti flavis; scutello fere quadrato, flavo, angulis posticis prominentibus; metanoto piceo; segmento basali abdominis obscure fulvo, postice piceo, segmentis reliquis nigris, postice chalybeis nitidis, singulatim macula trigona flava laterali notatis; pleuris nigris, punctatis, albido marginatis; mesosterno valde convexo, nigro, nitido, antice albido marginato; pedibus fulvis, coxis omnibus albidis, trochanteribus puncto nigro notatis; alis pallidis, venis et stigmatibus fuscis, area pone stigma fusco suffusa, cellula marginali apice acuta, cellula prima submarginali incompleta parva, secunda multo majore et tertiæ æquali, margine antico alarum pone stigma haud oblique truncato.*

*Long. corp. lin. 6. Expans. alar. antic. unc. 1.*

*Hab.* in Nova Hollandia. In Mus. Hopeiano Oxoniæ.

14. *PERGA CRESSONII*, sp. nov. (Plate XXXVII. fig. 1.)

*Fœmina.* *Nigra, nitida, flavido varia, abdominis segmentis mediis rufis, femoribus et tibiis 2 posticarum apice nigris; capite nigro, parce punctato, nitido; labro, clypeo, macula magna bipartita frontali ad clypeum extensa et cum macula utrinque ad oculorum marginem internum conjuncta, margine laterali capitis pone oculos guttisque duabus verticalibus flavidis; antennis brevissimis, fulvis; mandibulis totis nigris; thorace nigro, nitido, magis punctato et longitudinaliter impresso; collaris lateribus dilatatis, albidis, gutta antica nigra; scutello transverso, flavido, margine postico fere recto et utrinque angulato; metanoto et basi segmenti primi abdominis chalybeo-nigris; abdominis segmentis reliquis rufis, ultimis nigris; mesopleuris macula oblonga et metapleuris gutta ovali flavidis; coxis nigris; femoribus anticis piceo-luteis, subtus fuscis, posticis nigris; tibiis tarsisque pedum posticorum apice piceis; alis hyalinis, fusco vix tinctis, stigmatibus venisque nigris, cellula prima submarginali majore quam sequens, tertiæ apice valde obliquo et curvato, area anali prope basin nubila fusca.*

*Long. corp. lin. 8. Expans. alar. antic. lin. 14.*

*Hab.* Swan River (*De Boulay*). In Mus. Hopeiano Oxoniæ.

15. *PERGA WALKERII*, sp. nov. (Plate XXXVI. fig. 5.)

*Fœmina.* *Nigra; capite, collaris lateribus dilatatis, pedibus anticis, tibiis et tarsis 4 posticis, abdominis dimidio apicali obscure fulvis; capite fulvo, linea parva inter oculos nigra, vertice convexo utrinque impressione rotunda parum profunda notato, lateribus collaris fulvis punctatis; mesonoto antice opaco et in medio linea*

*tenui impresso, dorso pone lineam subplano nitido parum punctato; scutello nigro, nitido, subpunctato, transverso-quadrato, sulco medio, tuberculis binis minutis nigris instructo et postice marginato; metanoto et segmentis tribus basalibus abdominis nigris; horum lateribus sensim, cum segmentis reliquis abdominis totis, rufo-fulvis; thorace infra toto nigro, nitido, parum punctato; pedibus anticis, geniculis, tibiis tarsisque pedum 4 posticorum fulvis, coxis omnibus nigris nitidis; abdomine infra nigro nitido, lateribus cum oviductu rufo-fulvis; alis fulvis, stigmatibus et venis castaneo-fulvis, cellulis prima et secunda submarginalibus distinctis fere æqualibus, tertia elongata, apice valde obliquo et in medio angulato.*  
*Long. corp. lin. 8½. Expans. alar. antic. lin. 16.*  
*Hab. in Nova Hollandia, Sydney. In Mus. Hopeiano Oxoniæ.*

16. PERGA DALMANI, sp. nov. (Plate XXXVI. fig. 2.)

*Fœmina. Testaceo-fulva; labro, clypeo, tuberculis duobus antenniferis, margine postico loborum collaris pedibusque albidis, apicibus femorum et tiliarum posticarum nigris; capitis vertice pone ocellos bimpresso; antennis concoloribus, articulo tertio duplo longiore quam quartus; mesonoto sulco antico medio abbreviato, lateribus rectis acute elevatis; scutello subrotundato, convexo, punctato, bituberculato; abdomine subcylindrico, subnitido, cum metanoto concolori; corpore toto (cum pleuris) etiam concolori; pedibus cum coxis pallidioribus subalbidis, femoribus et tibiis pedum 2 posticorum apice nigris; alis subfulvescentibus, venis stigmatibusque magis fulvis, cellula prima submarginali parva, vena ejus postica subobliterata, cellula secunda duplo majore, tertia haud multo majore quam secunda, apice paullo curvato.*

*Long. corp. lin. 5. Expans. alar. antic. lin. 10.*

*Hab. in Nova Hollandia. In Mus. Hopeiano Oxoniæ.*

*Variat paullo major coloribusque magis vividis; scil. loborum collaris marginibus, tuberculis scutelli lineaque utrinque a scutello ad basin alarum flavidis, collaris disco lineisque duabus laterali-bus mesonoti nigricantibus, venis alarum piceis, femoribus posticis fulvis, mesosterni medio piceo.*

*Long. corp. lin. 5½. Expans. alar. antic. lin. 11½.*

*Hab. in Australasia, Melbourne (Thwaites). In Mus. Hopeiano Oxoniæ.*

17. PERGA HARTIGII, sp. nov.

*Fœmina. Capite, thorace cum scutello piceo-nigris, punctatissimis; abdomine, pedibus alisque fulvis; clypeo et labro cum tuberculis antenniferis fulvis nitidis; antennis albidis, oculos ultra extensis, articulis tribus intermediis gracilibus æque longis; capitis lateribus verticeque postice et marginibus angustis loborum collaris fulvis; mesonoto antice sulco tenui abbreviato, duobus alteris profundioribus obliquis, postice conjunctis, mesonoti lateribus acute elevatis parallelis; scutello subrotundato, opaco, in medio parum impresso, tuberculis duobus parvis fulvis instructo; metanoto abdomineque fulvo; thorace subtus nigro, nitidissimo; pleuris scabris, concolori-*

*bus; coxis nigris, trochanteribus et basi femorum albidis; pedibus fulvis, femoribus duobus posticis nigricantibus; alis fulvescentibus, stigmate venisque magis fulvis, cellula prima et secunda fere æqualibus, tertia præcedentibus duobus simul sumptis paullo minore, apice obliquo et fere recto.*

*Long. corp. lin. 8. Expans. alar. antic. lin. 16.*

*Hab. in Nova Hollandia. In Mus. Hopeiano Oxoniæ.*

18. PERGA PELETIERII, sp. nov. (Plate XXXV. fig. 6.)

*Mas. Piceo-nigra, opaca, abdominis dimidio basali testaceo, apicali nigro nitido; capite thoracis latitudine, labro et clypeo nigris nitidis, mandibulis fulvis dentibus nigris; antennis longioribus, ultra oculos lateraliter extensis, articulis tertio, quarto et quinto oblongis, sexto basi angustato; vertice subplano, guttis duabus dorsalibus lineisque duabus posticis fulvis; collari piceo-nigro, linea tenuissima marginali; scutello fere rotundato, convexo, tuberculis duobus posticis fulvis, metanoto et segmentis duobus basalibus abdominis late testaceis, segmento tertio nigro opaco, reliquis nigris nitidis; pleuris mesosterni nigris, punctatis, margine tenuissimo antico luteo, mesosterno nigro nitido; abdomine angustiore quam thorax, convexo, lateribus parallelis; coxis et trochanteribus nigro luteoque variegatis; pedibus testaceis; alis fulvis, costa stigmatate et cellulis sub stigmate magis fulvis, apice alarum cinerascete, cellula marginali oblongo-ovata, basi et apice attenuatis, cellula submarginali secunda pentagonali, margine antico alarum pone stigma laud angulato-truncato.*

*Long. corp. lin. 6½. Expans. alar. antic. unc. 1.*

*Hab. in Nova Hollandia. In Mus. Hopeiano Oxoniæ.*

19. PERGA NEWMANNI, sp. nov.

*Mas. Fusco-nigricans, capite et thorace opacis granulosis, abdomine nitido, capitis vertice subplano a parte postica lutea angusta subacute separato; antennis perbrevis; collari, scutello, lateribus mesonoti, abdomine (segmentis duabus basalibus nigricantibus exceptis) pallidioribus luteo-testaceis; thorace subtus cum pedibus omnino luteo, femoribus tibiisque duabus posticis magis castaneis; mesopleuris concoloribus, granulosis; mesosterno polito, linea media longitudinali impresso; scutello convexo, medio subimpresso, postice bituberculato; pedibus brevibus; alis fulvis, venis obscurioribus, costa et stigmate castaneis, margine antico alarum pone stigma oblique truncato, cellula marginali apice truncata, cellula prima submarginali cum sequente confluyente (vena transversa fere obsoleta).*

*Long. corp. unc. ½ (6 lin.). Expans. alar. antic. lin. 11.*

*Hab. in Australia. In Mus. Hopeiano Oxoniæ.*

*Var. Minor, coloribus clarioribus, facie (infra oculos), capite pone oculos, lateribus collaris et mesonoti, scutello corporeque subtus omnino magis fulvis (mas).*

*Long. corp. fere lin. 5. Expans. alar. antic. lin. 10.*

20. PERGA KIRBII, Leach, Zool. Misc. iii. p. 117. (Plate XXXVII. fig. 4.)

"*P. lutescens, capite thoraceque supra fusco-ferrugineis, abdominis dorso violascenti-ferrugineo; alis hyalinis, costa stigmatique ferrugineis; abdomine lineari. Maris long. corp. 9, expans. alar. 18 lin. Mus. Kirby.*"—LEACH.

Obs. Typus masculinus Leachianus hujus speciei valde distinctæ olim in Mus. Kirbii, nunc in Mus. Hopeiano (a Leachio ipso inscriptus) hospitatur.

21. PERGA DAHLBOMII, Westw. (Plate XXXV. figs. 3, 4.)

*P. bicolori, Leach, affinis magnitudine et habitu, differt scutello plano, postice marginato, cellulaque secunda submarginali parva tertique subovali imprimis distincta.*

*Capite nigro; labro, clypeo mandibulisque concoloribus, tuberculis antenniferis guttaque pone oculos luteis; antennis brevissimis, nigris; collaris lateribus dilatatis, luteis, antice parum obscurioribus; scutello albido-luteo, subplano, postice tenuiter marginato; abdomine nigro-chalybeo; alæ stigmatibus venisque nigris, cellulis submarginalibus prima et secunda æqualibus, tertia multo majore elongata subovali, apice valde curvato; pleuris mesosterni nigris, macula magna semiovali et metapleuris gutta rotunda luteis notatis; coxis anticis basi albidis; pedibus luteis, femoribus omnibus basi apiceque tibiæ et tarsorum in posticis nigris.*

*Mas differt vertice longitudinaliter impresso, et maculis duabus rotundis luteis notato, thorace magno, antice elongato, abdomine parum minore quam thorax, alarum anticarum stigmatibus magno margineque antico pone stigma haud subito oblique truncato.*

*Long. corp. ♂ lin. 5, ♀ 6½. Expans. alar. antic. ♂ lin. 10, ♀ lin. 12.*

*Hab. in Australasia. In Mus. Hopeiano Oxoniæ.*

22. PERGA BICOLOR, Leach, Zool. Misc. iii. p. 116.

"*Pernigra, clypeo, capitis lateribus, thorace ante squamas utrinque, scutello, tibiis, tarsis coxisque 4 posticis albidis, tarsis tibiisque 4 posticis apice nigris; alis hyalinis, apice fuscescentibus, pterygosteis nigris. Femora postica basi albida. Mas adhuc latet.*" (Leach.)

*Species nigra, labro nigro, clypeo scutelloque luteis, coxis, trochanteribus basi femorum 2 posticorum albidis distincta.*

*Scutellum convexum, medio longitudinaliter impressum. Alarum anticarum cellula secunda submarginalis præcedente vel sequente major; cellula tertia subquadrata.*

*Long. corp. 7½. Expans. alar. 11¾ lin.*

*Long. indiv. nonnullorum femineorum in Mus. Hopeiano lin. 6½; expans. alar. antic. lin. 12½.*

*Hab. in Australasia (South Australia, Damell).*

23. PERGA SPINOLÆ, sp. nov. (Plate XXXVI. fig. 4.)

*Fœmina. Subgracilis, cylindrica, piceo-nigra, punctata, abdominis basi et apice flavis, alis anticis dimidio apicali magis fuscis; labro,*



*clypei margine, antice orbita (nisi supra) oculorum et tuberculis antenniferis obscure fulvis, vertice immaculato bisulcato; collari nigro, flavido tenuiter marginato; mesonoto longitudinaliter sulcato scutello subquadrato, tuberculis duobus ad angulos posticos fulvis instructo; abdomine piceo, segmento primo et duobus ultimis fulvis, reliquis postice tenuissime fulvo marginatis, pleuris mesothoracis et mesosterno valde convexis, nigris, nitidissimis, metapleuris gutta parva fulva; femoribus 4 anticis piceis, basi et apice pallidis; coxis posticis dimidio apicali cum trochanteribus et dimidio basali femorum albidis; tibiis anticis piceo et flavido variis, posticis flavidis, apice late nigris; tarsis flavidis; alis basi pallidis, ultra medium obscurioribus, stigmate fulvo, venis nigricantibus, cellula prima submarginali distincta at minore quam sequens, secunda et tertia fere æqualibus, apice recte truncatis.*

*Long. corp. lin. 6. Expans. alar. lin. 12 (1 unc.).*

*Hab. in Australasia. In Mus. Hopeiano Oxoniæ.*

24. PERGA LATREILLII, Leach, Zool. Misc. iii. p. 116. (Plate XXXVI. fig. 3.)

*"P. luteo-ferruginea; capite, thoracis dorso tarsisque posticis basi nigris, pectore ventrequè lutescentibus; clypeo, vertice maculis, scutello squamis, thoracis margine pleurisquè albidis; alis hyalinis; pterygosteis luteis; abdomen articulis duobus primis basi utrinquè nigricantibus; antennæ articulis duobus basilaribus nigris. Femina latet.*

*"Long. corp. lin. 5½. Expans. alar. 9½ lin." (Leach.)*

Descriptionem fusiorem typi Leachiani hujus speciei in Museo Britannico hic offero:—

*Caput latum, supra nigrum, margine postico lateraliter dilatato, punctis duobus parvis verticalibus ovalibus, alteris duobus ad marginem internum oculorum, tuberculis duobus antenniferis, antennis (nisi articulis duobus basalibus nigris), clypeo transverso convexo luteo-fulvis; labro obscure fusco; collari nigro postice fulvo marginato, lateribus fulvis; mesonoto piceo-nigro, macula trigona media dorsali scutelloquè fulvis; segmentis duobus abdominalibus rufo-fulvis, basi nigris; abdomine reliquo pedibusquè castaneo-rufis, illo angusto, subparallelo, apice truncato; tarsis posticis fuscis; alis obscure fusciscentibus, costæ basi stigmatequè fuscis.*

Individua tria masculina, in Mus. Hopeiano conservata, huic speciei pertinentia (ut mihi videtur) puncto elongato-luteo in medio dorsi thoracis (ante scutellum) tarsisque posticis basi parum obscurioribus (nec nigris), alis pallide infumatis, costâ stigmatiquè brunneis distinguuntur.

*Long. corp. lin. 5. Expans. alar. lin. 9.*

*Hab. in Australasia (South Australia, Damell).*

25. PERGA MACLEAII. (Plate XXXV. fig. 2.)

*Species perelegans, glaberrima, capite et thorace fulvis, hoc nigro bimaculato; abdomine chalybeo, albido fasciato; alis flavidis, medi*

*fusco fasciatis; capite fulvo, laevi, fronte antice in medio supra basin antennarum parum porrecta, vertice pone ocellos triimpresso, mandibulis apice castaneis; (antennis fractis;) mesonoto antice canali medio instructo, lateribus dorsi elevatis nigris, utrinque linea impressa obliqua a dorsi medio separatis; scutello transverso quadrato, postice parum angustato, in medio subimpresso, utrinque postice tuberculo fulvo instructo; abdomine chalybeo nitidissimo, segmentis basalibus utrinque, posticis omnino albido fasciatis; corpore infra fulvo; abdomine cyaneo, segmentis anguste albido marginatis; pedibus piceis; alis magnis, flavidis, costa stigmatum castaneis, hoc basi nigro, fascia media transversa fusca; cellula marginali fere ad apicem alæ extensa, cellula prima submarginali brevi transversa, secunda et tertia fere æque longis, hac latiore, apice recte truncato; cellula marginali in alis posticis interdum vena transversa recta prope apicem in duas partes divisa. (Fœmina.)*

*Long. corp. lin. 6½. Expans. alar. antic. lin. 14.*

*Hab. in Australasia. In Mus. Hopeiano Oxoniæ.*

26. PERGA BELLA, Newman, 'Entomologist,' p. 89.

"Testacea: caput testaceum, oculis nigris; ocelli nigri in macula concolori siti; antennarum articuli 1. et 2. atterimi, apicibus tenuiter albis, 3. fuscus, cæteri lutei; antennæ tubere albo sitæ; oculorum margo anticus albus, genæ quoque albæ; epicranium asperum, maculis 2 albis signatum; clypeus testaceus, lateribus albis: prothoracis scutellum margine postico albo: mesothoracis scutum asperum, punctum, linea mediana marginibusque lateralibus elevatis albis, lineis quoque nonnullis nigris; mesothoracis scutellum dentibus 2 posticis sublongis obtusis instructum; mesopleura puncta, margine imo falciformi late albo: metapleura nigro varia, macula elevata mediana subtrigona alba; mesosternum atterimum, glaberrimum: pedes flavidi, coxis albis: abdomen testaceum, maculis 7 lateralibus elongatis albis, subtus testaceo nigroque varium.

"Corp. long. 7 unc., alar. lat. 1.4 unc.

"Inhabits New Holland. A single specimen of this beautiful insect (now in cabinet of Entomol. Club) was taken by Mr. Davis at Adelaide."—Newman.

*P. ferrugineæ*, Leach, proxima, sed multo major, alarum anticarum medio paullo saturatiore. Variat colore saturatiore maculis distinctioribus, maculis 7 oblongis, albidis, lateralibus abdominis distinguenda, abdomine etiam segmentis ventralibus interdum testaceis, interdum nigris nitidis segmento ultimo cum oviductu testaceo, interdum omnino nigris oviductu piceo.

Individua plurima fœminea in Mus. Hopeiano Oxoniæ hospitantur, variant longitudine unc. ½ ad unc. ¾, et expans. alar. antic. unc. 1½ ad unc. 1½.

Individua hujus speciei ex Adelaida in museo Hopeiano cum nomine falso *P. ventralis*, Westw., inscripto e Dom. Smith accepta, et alia similiter nominata in Mus. Britannico continentur.

Alia individua, ex Adelaida, pallidiora (scil. magis lutescentia) in

museo Hopeiano etiam hospitantur cum nomine falso *Perga ferruginea*, Leach, a Smithio inscripta.

27. *PERGA FERRUGINEA*, Leach, Zool. Misc. iii. p. 118.

"*P. ferruginea abdomine pallidior; labro, clypeo, fronte, antennis, tarsis omnibus tibiisque quatuor posticis luteis, alis subfulvescentibus. Mas latet.*

"*Long. corp. 6½, expans. alar. antic. lin. 12.*" (Leach.)

*Hab.* in Australasia (Sidney, Moreton Bay, &c.).

Individua plurima cum typo Leachiano (a Leachio ipso inscripto) in Mus. Hopeiano hospitantur.

Caput et thorax opaca, abdomine magis castaneo nitido, femoribus tibiisque duabus posticis castaneis; alarum anticarum stigmatibus castaneo, cellula marginali angusta fere lineari ad basim acutiuscula, versus apicem sensim latiore, apice obtuso, cellulis submarginalibus tribus basalibus perbrevibus, tertiæ apice obliquo.

28. *PERGA LEWISII*, Westw. Trans. Ent. Soc. Lond. vol. i. p. 234 (P.S.), and vol. ii. Proceedings, p. xlv; Arcan. Ent. i. p. 23, pl. 7. fig. 1.

*Ochracea, capitis thoracisque linea laterali apiceque tibiarum et articulorum tarsalium posticorum nigris.*

♀ *supra obscure ochracea; caput magnum, quadratum, fere thoracis latitudine; antennis articulo sexto precedentibus tribus articulis parum longiore; venum transversa inter cellulas 1<sup>m</sup> et 2<sup>m</sup> alarum anticarum sæpe obsoleta; stigmatibus magno; capite subtus et mesosterno luteis; tibiæ 2 posticæ apice, apiceque articuli primi tarsalis et articulis reliquis fere omnino nigris; antennæ perbreves, articulis 2<sup>o</sup>, 3<sup>o</sup>, et 4<sup>o</sup> fere æqualibus; clypeus valde rugosus; prothoracæ (collare) in medio fere obsoletus; mesonoto plano continuo; scuto impressione a parapsidibus haud separato; scutello antice rotundato, angulis posticis oblique truncatis; abdomine ♀ depresso, apice acuminato; tarsorum articulis apice dilatatis; pedum posticorum tibiis apice apiceque articulorum tarsalium nigris; alæ antice stigmatibus fere lineari angusto, apice subobtusis; cellula prima submarginali a secunda vena (sæpe oblitterata) vix separata.*

*Long. corp. lin. 10. Expans. alar. antic. unc. 1½ (=lin. 16).*

*Hab.* in Terra Van Diemenii.

Individua plurima in Mus. Hopeiano Oxoniæ adsunt: marem non vidi.

Var. minor, coloribus et facie omnino simillima, e Terra Van Diemenii et Adelaide in Mus. Hopeiano. Long. lin. 8, expans. alar. lin. 13.

*P. ferrugineæ*, Leach, valde affinis, sed multo major tarsisque dilatatis distincta.

An interesting account of the habits of this species by Mr. R. H. Lewis appeared in the first volume of the 'Transactions of the Entomological Society of London,' with the heading "Case of Maternal

attendance on the Larva by an Insect of the Tribe of Terebrantia, belonging to the Genus *Perga*, observed at Hobarton, Tasmania." The female insect deposits her eggs in a longitudinal incision between the two surfaces of the leaves of one of the *Eucalypti*, adjoining the midrib. The eggs, about eighty in number, are placed transversely in a double series. They are of an oblong form, two lines in length and half a line in breadth. On this leaf the mother sits till the exclusion of the larvæ (which takes place in a few days); nor can she be made to leave the spot except by actual force, clinging to the edges of the leaf by her flexible tarsi. The larvæ, when hatched, are of a dirty-green colour, with shining black heads: they keep together in the brood, arranging themselves in oval masses with their heads pointing outwards. They appear to feed chiefly by night; the mother insect sitting with outstretched legs over her brood, preserving them from the heat of the sun and attacks of their enemies with admirable perseverance, never offering to use her wings (even when disturbed) or moving from the spot. Instances are mentioned where two mother insects were found tending one large brood, a smaller adjacent one being without the parent; and, although so anxious in the defence of the young, they allowed themselves to be transposed to other broods, which they tended with equal assiduity for a period of from four to six weeks. They were, however, never observed to render any direct assistance to the larvæ; indeed the broods which had been accidentally deprived of their mothers were still in a thriving state. Previously to casting their skins, the larvæ arrange themselves in an oval mass with their heads pointing outwards, and the anterior legs elevated, resting on the four posterior only. The remainder of the body is likewise thrown upwards; and their tails meet in the centre, forming a conical mass, concealed in the midst of which are the small and feeble individuals of the brood. In a subsequent communication Mr. Lewis states that there is but one brood in the year, and the earliest portion of their lives is passed during the winter season, when they are subject to heavy rains. When resting in the day the larvæ, like those of most other Terebrantia, carry their heads erect, emitting a drop of a yellow gummy fluid from the mouth; and if touched they throw their heads back and vomit this fluid in some quantity. It is very thick, and seems to be given to them as a protection against Ichneumonidæ, one of which tribe preys upon them; but the author had seen one of the Ichneumons dead with the wings and legs covered and glued together by this gummy matter.

29. PERGA SMITHII, Westw. (Plate XXXVI. fig. 6.)

*Fœmina gracilis. P. lewisii similis, at multo minor, pallidior, abdomine nitido lutescente, dimidio apicali castaneo, tibiarum posticarum apice et articulis tarsorum posticorum apicibus nigris.*

*Long. corp. lin. 6-7. Expans. alar. antic. lin. 10½-12.*

*Hab. in Australasia. In Mus. Hopeiano.*

*P. ferrugineæ*, Leach, affinis, differt corpore graciliore, abdominis dimidio apicali obscure castaneo; tarsis elongatis, posticis nigro an-

nulatis. Caput subdepressum, punctatum, vertice bicanaliculato, macula elevata ovali nigra nitida utrinque pone oculos; antennis et mandibulis nigris. Thorax punctatus, utrinque macula parva nigra ante tegulas et ad originem impressionum duarum obliquarum (scutum mesothoracicum, medio canaliculatum includentium). Scutellum medio impressum, postice utrinque angulatum. Abdomen nitidissimum, pallide luteo-flavidum, dimidio apicali castaneo; pedibus elongatis, concoloribus, apicibus articulorum tarsalium nec non tibiæ duarum posticarum nigris; corpore toto infra cum coxis et pedibus pallide luteo-flavido. Alæ pallide fulvescenti-hyalinæ, stigmata castaneo, venis fulvis, cellula prima submarginali omnino oblitterata, secunda fere tertiæ æquali, hujus apice obliquo curvato.

Long. corp. lin. 7, expans. alar. lin. 12.

*Hab.* in Australasia. In Mus. Hopeiano Oxoniæ.

### 30. PERGA SCABRA, Newman, Zoologist, 1846, t. 4. p. 1274.

"Colour brown, the legs being paler than the body. The head is of nearly equal width with the prothorax and semiporrected; the ocelli are placed in a triangle, the base of which is much the longest, the anterior ocellus being but little in advance of the other two; every part of the head is rendered scabrous by irregular, deep, and often confluent punctures; the vertex has, moreover, two vague longitudinal depressions, and between them a slight central longitudinal sulcus terminating at the anterior ocellus; the antennæ are remarkably short, even for the genus, when extended laterally they scarcely reach beyond the eyes. The prothorax is sculptured in the same manner as the head, and has various depressed spaces and elevated ridges, all of which have a longitudinal direction. The abdomen is glabrous, its extremity much recurved. The wings partake of the brown colour of the entire insect.

"The length varies from  $\frac{1}{5}$  to  $\frac{1}{8}$  of an inch.

"Inhabits Australia (*Lieut. Ince*)."

An *P. ferruginea*, Leach?

### 31. PERGA VENTRALIS.

*Perga (Pseudoperga) ventralis*, Guérin-Ménéville, Icon. R. An. Ins. texte, p. 399.

"Antennes noires, avec une petite tache fauve sous l'extrémité du dernier article. Tête noire en dessus, jaune en dessous. Mandibules noires, labre jaune. Chaperon jaune bordé de noirâtre. Un petit point jaune sur l'insertion des antennes. Thorax rugueux, noir, bords latéraux au prothorax, côtés du mésothorax sur les rebords latéraux, tégules des ailes et une petite tache vague aux bords latéraux de l'écusson jaunâtres. Dessous du prothorax jaune. Dessous du mésothorax noir, avec une large tache jaune de chaque côté. Ailes hyalines à nervures rougâtres, le point épais est très dilaté, aussi large que la cellule radiale; et l'extrémité de l'aile se rétrécissant brusquement semble tronquée obliquement au bord antérieur à partir de la callosité. Pattes d'un jaune fauve, avec l'extrémité des cuisses,

des jambes et des tarses postérieurs d'un brun noirâtre. *Abdomen* jaune-fauve, avec tout le dessus d'un bleu noirâtre, garni d'un très fin duvet gris soyeux et chatoyant."

Long. corp. 15 mill.

*Hab.* in Terra Van Diemenii.

### 32. PERGA LEACHII, sp. nov.

*Capite supra nigro, margine postico (lateribus dilatatis), maculis duabus oblongis verticalibus, antennis, facie infra antennis, mandibulis (apicibus nigris) pedibusque luteo-flavidis; collari piceo, marginibus posticis luteis; abdomine obscure luteo-fusco, cerulescenti metallice nitente; scuto mesonoti trigono, postice luteo marginato, in medio canaliculato, marginibus elevatis scutelloque luteis; hoc obtrigono, postice tuberculis duobus prominentibus instructo; abdomine infra luteo-fulvo.*

Long. corp. lin. 6. *Expans. alar. antic. lin.* 11.

In Museo Britannico insectum fœmineum continetur nomine falso *P. kirbii* inscriptum.

Etiam in Museo Hopeiano (e Melbourne), alis pallide lutescentibus, anticis apice rotundatis, stigmate obscuriore; cellula prima submarginali parva sed distincta, quadrata, cellula tertia magna, antice et postice recte truncata, antennis distincte 7-annulatis.

### 33. PERGA HALIDAI, sp. nov. (Plate XXXVII. fig. 5.)

*P. leachii* valde affinis forma et structura, sed minor et aliter colorata. *Fœmina.* *Capite et thorace nigris subnitidis, levissime punctatis, facie infra, lateribus capitis et maculis duabus verticalibus, antennis, pedibus, scutelloque bituberculato fulvis; abdomine castaneo; alis fulvis; labro, clypeo (cum punctis duobus minimis mediis nigris), mandibulis (dentibus nigris) et lateribus capitis fulvis; vertice nigro, convexo, haud sulcato, maculis duabus ovatis fulvis; antennis ultra oculos longe extensis, distincte 7-annulatis, articulo tertio duobus sequentibus simul sumptis longitudine aequali gracili, ultimo ovali, certo situ ante medium ejus subarticulato; collaris lateribus nigris, fulvo marginatis; mesonoto nigro, sulco anticolongitudinali et duobus alteris obliquis postice convergentibus; scutello semiovali, convexo, supra subsulcato, postice tuberculis duobus obtusis instructo, lineisque 4 gracilibus a scutello utrinque ad basin alarum extensis; metanoti annulo ultimo (fulvo marginato) basique segmenti primi abdominis nigris; reliquis segmentis rufis, lateribus albidis, segmentisque ceruleo parum nitidis; mesosterno cum pleuris nigris nitidis, fere impunctatis, his albido late marginatis, et metapleuris macula ovali albida notatis; pedibus cum coxis pallide fulvis; abdomine infra basi fusco, postice cum lateribus late albidis; alis pallide fulvis, stigmate et venis fulvis, cellula prima submarginali parva distincta quadrata, secunda duplo majore, tertia magna, oblonga, apice recte truncata.*

Long. corp. lin.  $6\frac{1}{2}$ . *Expans. alar. antic. lin.* 14.

*Hab.* in Adelaide. In Mus. Hopeiano Oxoniæ.

## 34. PERGA JURINEI, sp. nov. (Plate XXXVII. fig. 6.)

Mas. *Nigra, flavido varia, abdomine supra purpureo, ultra medium magis cærulescente, apice extremo luteo, antennis pedibusque fulvis, alis subfulvis, anticarum medio fusco parum suffuso; capite supra transverse quadrato, convexo; labro, clypeo antice, tuberculis antenniferis, antennis, capitis lateribus pone oculos et intraorbitali maculisque duabus oblongis verticalibus fulvis; antennis distincte 7-articulatis, articulo tertio longitudine quarti et quinti simul sumptis æquali, sexto parum majore quam præcedens, septimo oblongo ovali; ocello centrali in fossula posito; collaris lateribus nigris late flavo marginatis; mesonoto nigro, punctatissimo; scutello parvo, semiovali, postice bituberculato, convexo, utrinque cum linea tenuissima ad basin alarum extensa fulva; metanoto perbrevis, postice tenuiter fulvo marginato; abdomine segmentis lateraliter fulvo marginatis; mesopleuris nigris, albido late marginatis; mesosterno nigro, nitido, antice albido lineato; abdomine infra lutescente; pedibus flavidis, femoribus et tibiis 2 posticis magis fulvis; alis pallide fulvescentibus, anticis medio obscurioribus, venis stigmatæque fulvis, cellula marginali elongato-ovalis, cellula tertia submarginali permagna, apice recte truncato.*

*Long. corp. lin. 4½. Expans. alar. antic. lin. 9.*

*Hab. in Australasia, Melbourne (Bakewell). In Mus. Hopeiano Oxoniæ.*

*Variat mas capite fere toto fulvo, fossula ocelligera lineisque duabus ex oculis per verticem ductis obscuris; mesonoti scuto conico, fulvo, fossula media nigra antice notato, pedibus posticis fulvis.*

*Long. corp. lin. 5½. Expans. alar. antic. lin. 10½.*

*Hab. Swan River. In Mus. Hopeiano Oxoniæ.*

## 35. PERGA MAYRII, sp. nov. (Plate XXXVII. fig. 7.)

Fœmina. *Capite toto, antennis (brevissimis), collaris lateribus, dorso mesonoti, maculis duabus scutelli, abdomine toto, pedibus anticis, tibiis tarsisque 4 posticis fulvis, scutelli parte relicta et metanoto castaneis, femoribus 4 posticis nigris; facie infra trisulcata, sulcis supra ocellos terminatis, vertice supra convexo integro; antennis tantum 5-articulatis, articulis 3º et 4º perbrevibus, secundo parum gracilioribus; collaris lateribus fulvis, punctatis; metanoto fulvo, in medio nigricante; scutello transverso, lateribus subrotundatis, postice leviter trisinuato, dorso subplano, castaneo, glabro, utrinque macula fulva notato; metanoto annuliformi, nigricante; abdomine subangusto, cylindrico, toto fulvo; coxis anticis piceis, posticis nigris, nitidis, femoribusque nigris geniculis luteis; thorace subtus nigro, nitidissimo, glabro; alis fulvis, venis stigmatæque castaneo-fulvis, vena inter cellulas prima et secunda submarginales fere oblitterata, cellula tertia magnitudine anticis duabus subæquali, hujus apice valde obliquo et curvato.*

*Long. corp. lin. 7. Expans. alar. antic. lin. 13½.*

*Hab. Swan River (De Boulay). In Mus. Hopeiano Oxoniæ.*





2. On a supposed Instance of Hybridization between a Cat and Lynx. By W. J. HOFFMAN, M.D.

[Received April 7, 1880.]

The following statement was made to me a short time since by a medical gentleman, late of the U. S. Army, as having occurred during his residence at Camp Apache, Arizona Territory, about six years ago. The doctor had received orders to report at that isolated station, and took a pet Cat with him, partly on account of his admiration for the animal, also for the purpose of ridding the quarters of annoying rodents.

Upon the arrival of spring the Cat began to show symptoms of restlessness, with occasional fits of irritability, which would at times be replaced by evidences of more than ordinary affection and playfulness. Suspecting that the chief cause of these demonstrations was sexual excitement, and knowing that there was no other cat within eighty or a hundred miles of the station—the intervening country being badly broken and very desolate, the result was watched with interest.

One day the Cat disappeared and remained away for over a week, when she as mysteriously made her reappearance with an apparent sense of contentment and a desire to remain about the building. In due time she gave birth to four kittens, three of which resembled the mother, but the fourth had a tail of but half the normal length, and was also of a greyish tawny colour, in time also growing much larger than the rest. As it grew up it became very tame, following its master around the buildings like a dog, showing various characteristic traits of the Lynx, such as the gait, quickness of motion, climbing trees, etc.

As a Lynx (*Felis rufa*) is exceedingly common in the dense woods surrounding the Post, it is but reasonable to attribute the paternity of the kittens to the above-named species, especially so when we consider the general resemblances above stated.

Washington, March 25, 1880.

3. Contributions to the Anatomy of Passerine Birds.—Part II. On the Syrinx and other Points in the Anatomy of the *Eurylæmidæ*<sup>1</sup>. By W. A. FORBES, B.A., F.L.S., F.G.S., Scholar of St. John's College, Cambridge, Prosector to the Society.

[Received April 5, 1880.]

The true position of the Broadbills or *Eurylæmidæ* in the series of birds, and particularly the question as to their passerine or non-passerine affinities, has long been in question amongst systematic

<sup>1</sup> Part i. *suprà*, p. 143.

ornithologists<sup>1</sup>. That more intimate knowledge of their structure from which alone any true answer to this question could be given, has been likewise gradually accumulating for many years.

Nitzsch, in his great work on Pterylography, published posthumously in 1840, showed that the species examined by him possessed a characteristically Passerine pterylosis<sup>2</sup>. Johannes Müller, in 1846, in his classical memoir on the vocal organs of Passeres<sup>3</sup>, remarked that in *Corydon sumatranus*, the only species of this group examined by him, there were "no muscular fibres on the larynx." Blanchard, in 1859<sup>4</sup>, showed that *Eurylæmus javanicus* agreed in its sternal characters with other Passeres, and particularly compared it with the Swallows in this respect.

Mr. Scater<sup>5</sup>, in 1872, figured the sternum of *Cymbirhynchus macrorhynchus* (under the name of *Eurylæmus javanicus*; cf. Lord Walden, l. c. p. 370), and stated that in his opinion these birds were truly Passerine.

Prof. Garrod<sup>6</sup>, in 1877, was enabled, by an examination of dry skins of *Cymbirhynchus*, *Calyptomena*, and *Eurylæmus ochromelas*, to show that these species differed singularly from all other Passeres yet examined in that in them the tendon of the *flexor longus hallucis* sends a strong vinculum to the tendon of the *flexor digitorum profundus*, as in nearly all other non-passerine birds in which a hallux is developed. He also showed at the same time that in these species the palate was truly Passerine, and proposed to divide the order Passeres "into two sections to start with, those with the hallux not free (the *Eurylæmidæ*), and those with the hallux independently movable." The following year he was able to add to this account some facts in the anatomy of two other species, *Psarisomus dalhousiæ* and *Serilophus rubropygius*. These facts included the typical Passerine arrangement of the tendon of the *tensor patagii brevis* (P. Z. S. 1876, p. 508), the presence of the left carotid only, the

<sup>1</sup> For a succinct resumé of the opinions of ornithologists on this point, see Mr. Scater's paper in the 'Ibis,' quoted below.

<sup>2</sup> Ray Soc. ed., pp. 76, 77. These were *Corydon sumatranus*, *Calyptomena viridis*, *Eurylæmus javanicus* and *E. ochromelas*, and *Cymbirhynchus macrorhynchus*. In the three last named Nitzsch describes *nine* of the remiges as situated "on the hand;" in all the specimens of this group I have examined, I find there are *ten* primaries (cf. also Wallace, Ibis, 1874, p. 406, and Sundevall, Tentamen, p. 61). An examination of the pterylosis in my spirit-specimens has also convinced me of the partial inaccuracy of Nitzsch's figure of that of *Cymbirhynchus* (pl. iii. fig. 15). The lumbar saddle is here represented as too angular, and the inclosed space, as well as the antero-lateral tracts bounding it, too broad. The postero-lateral tracts also are represented as consisting of but a single row of feathers. In reality, in this species there is a large ephippial space, of an elongated oval shape, the whole shape of the saddle being more like that represented by Nitzsch in *Cephalopterus* (l. c. fig. 10.) The tracts behind are *two* feathers broad. In *Calyptomena*, judging from skins, there is an acutely-angled rhombic saddle, whilst in *Eurylæmus* the condition is intermediate.

I may add that in *E. ochromelas* and *Cymbirhynchus* the neck-feathering of the lower surface is uninterrupted till behind the middle, and that the throat is entirely feather-clad, with no naked symphyseal space.

<sup>3</sup> Garrod's edition, p. 27.

<sup>4</sup> Ann. Sci. Nat. (4) Zool. vol. xi. p. 92.

<sup>5</sup> Ibis 1872, p. 177, &c.

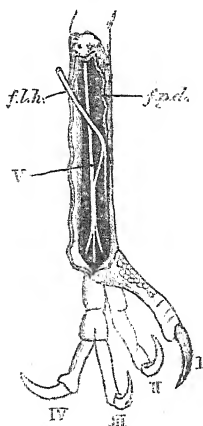
<sup>6</sup> P. Z. S. 1877, p. 447.

normal disposition of the vessels of the thigh, the presence of the femoro-caudal, semitendinosus and accessory semitendinosus, and the absence of the ambiens and accessory femoro-caudal muscles. He also called attention to the unforked condition of the sternum in *Psarisomus*, this feature resembling that figured previously by Mr. Sclater in *Cymbirhynchus*.

Having lately, through the kindness of Mr. Edward Gerrard, jun., become the possessor of a specimen each of *Cymbirhynchus macro-rhynchus* and *Eurylæmus ochromelas* from Sarawak, excellently preserved in spirits, I am in the position to supplement the above mentioned facts in our knowledge of the anatomy of the *Eurylæmidæ* by describing the syrinx and alimentary canal, previously hardly at all known at all in this group, in these two species, as well as of confirming or modifying previously published statements.

As regards osteology, the only point I wish to record is the unforked condition of the *manubrium sterni* in both species. In this respect they resemble the condition present in *Psarisomus*, as already

Fig. 1.



Left foot of *Cymbirhynchus macro-rhynchus*, viewed from behind, to show the deep plantar tendons, and the vinculum (*v.*), which the *flexor longus hallucis* (*f. l. h.*) sends to the tendon of the *flexor profundus digitorum*. The skin has been turned aside, and the superficial flexors removed; the *flexor longus hallucis* has been cut short above and displaced.

noticed by Prof. Garrod. As this feature appears equally in Mr. Sclater's figure of *Cymbirhynchus* above alluded to, as well as in a specimen of the sternum of that bird in the College of Surgeons, and in Mr. Eyton's figure of *Corydon sumatranus* (Osteol. Av. pl. 8. fig. 5), it seems probable that it is a regular character of this family of Passeres, though in other families of that group it seems to be an individual or specific characteristic.

Both the species under discussion agree entirely with *Psarisomus* and *Serilophus* in the points already noted by Prof. Garrod. I may add that the *pectoralis primus* is large, as is also the *pectoralis secundus*, this muscle extending to the end of the sternum, or thereabouts. As in other Passeres, the *biceps*-slip to the patagium and the *expansor secundariorum* are absent. The *semimembranosus* is slender, but muscular. The *gluteus primus* is large, covering the *biceps*; and the *obturator internus* is elongatedly oval. As will be seen in fig. 1, in *Cymbirhynchus* the vinculum in the deep plantar tendons is strong, and has the character of a firm round tendon, instead of being composed of more or less transversely-directed fibres running between the two tendons, as in many birds where this structure obtains. In *Eurylæmus ochromelas* it is apparently double, there being a second additional slip given off lower down from the hallux-tendon, which joins the tendon of the digital flexor at the point where the latter, splitting up into three, receives the main vinculum.

As regards the alimentary canal of these birds, there is nothing unusual in its conformation. The tongue is elongatedly cordate, and slightly bifid at the tip. Both it and the palate generally are smooth; along its posterior sides, it is provided, as is frequently the case, with about eighteen small, backwardly directed, spiny processes, that at the angle being much larger than the others. There is no crop developed; and the *proventriculus* is zonary: in *Cymbirhynchus* it is  $\frac{2}{3}$ , in *E. ochromelas*  $\frac{1}{4}$  inch in vertical depth. The stomach has the character of a not very muscular gizzard, and is lined with hardened brown epithelium; the left lobe of the liver is the smallest (considerably). The cæca are present, as might have been predicted from the *nude* oil-gland<sup>1</sup>, and are truly Passerine in nature, being mere nipples  $\frac{1}{8}$ , or, in the smaller species,  $\frac{1}{10}$  inch long. The following are the intestinal measurements:—

<i>Cymbirhynchus</i> .	Small intestine	$7\frac{3}{4}$ in.,	large intestine	$1\frac{1}{4}$ ,	total	9 in.
<i>E. ochromelas</i> .	„	$5\frac{1}{4}$ „	„	$\frac{3}{4}$ ,	„	$6\frac{1}{2}$ in.

The nature of the *syrix* was the most interesting question to be examined in these specimens, Müller's short allusion to that of *Corydon*, quoted above, being all that was known as regards its structure.

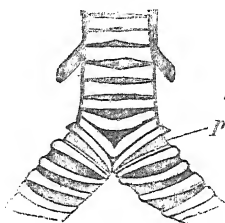
In *Eurylæmus ochromelas* the *syrix* is less specialized, as regards its cartilaginous constituents, than in *Cymbirhynchus*, and will therefore here be described first.

The tracheal rings have their usual complete form, being notched before and behind to varying extents, and separated only by narrow intervals. The strong *sterno-tracheales*, the only extrinsic syringeal muscles, are inserted on the last ring but five. Only the last two tracheal rings are modified. The penultimate ring is narrowed and slightly produced downwards in front; the last is also narrow, and closely apposed to the penultimate, the membranous interval between the two being very much reduced, except in the middle line in front,

<sup>1</sup> Cf. Garrod, P. Z. S. 1874, p. 119.

where it is well developed, the last ring being here notched above. Behind, the ultimate and penultimate rings are united by a vertically disposed median bar. The last ring forms a three-way piece, there being a forwardly-directed narrow *pessulus* developed from its hinder margin below. The *pessulus* is apparently membranous, in this specimen at least, except at its base. The first bronchial semirings are still narrower than the last tracheal one and strongly arched, being concave downwards. They are separated by a very slight interval indeed from the last tracheal ring (three-way piece), and are nearly in contact with each other in front in the middle line; behind they are inturned and somewhat thickened. To the *middle of each ring*, or a little posteriorly to this point, is attached the lateral tracheal muscle,

Fig. 2.

Syrinx of *Eurylæmus ochromelas*,  $\times 5$ , viewed from in front.

*p*, the "pseudo-ring."

which is extremely slender and hardly visible when dry. The second bronchial semirings are shorter than either the first or third; they are slightly deeper than the first pair, but are narrowed behind. Being only slightly concave downwards, a considerable membrane-covered fenestra is left between them and the first pair. What at first looks like a bronchial semiring is interposed between what are here described as the first and second of that category. This pseudo-ring is most evident in front (*vide* fig. 2), but is also visible when dry behind; it is apparently due to the accumulation of tissue inside, forming the outer boundary of each glottis. The third and fourth rings are slightly concave upwards: they are deeper, especially behind, thinning away towards the front, than those that preceded them. The fifth and other succeeding rings are typical, unmodified bronchial rings, which more and more encroach upon the *membrana tympaniformis*, and eventually almost overlap behind. The second and succeeding semirings are more or less incompletely ossified at their ends.

In *Cymbirhynchus macrorhynchus* (figs. 3-5), the syrx is constructed on essentially the same plan, with some modifications. The trachea, below the insertion of the extrinsic muscles (on the last ring but six), appears to be somewhat laterally compressed and diminished in size. In the specimen before me the last few tracheal rings are somewhat irregular in their disposition,

which may or may not be due to individual variation. The antepenultimate ring is apparently incomplete on the right side, or is at least exceedingly reduced (*vide* fig. 5). The penultimate ring is narrowed, and is closely apposed to the terminal ring throughout except in front, where there is a well-marked subtriangular fenestra. The last tracheal ring is produced downwards in front, but is ap-

Fig. 3.

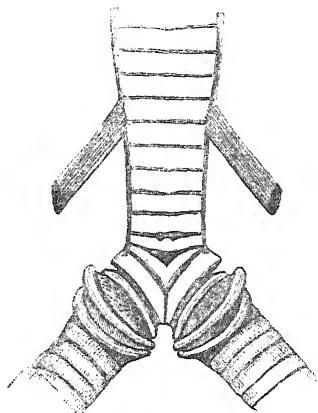
Syrinx of *Cymbirhynchus*, viewed from in front,  $\times 5$ .

Fig. 4.

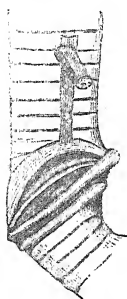


Fig. 5.

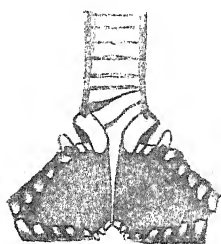


Fig. 4. The same,  $\times 5$ , from the side, to show the insertion of the intrinsic syringeal muscle into the *middle* of the first bronchial semiring. The *sternotrachealis* is cut short.

Fig. 5. The same,  $\times 5$ , from behind, to show the pessulus.

parently incomplete on the left side in front; so that there the penultimate ring is next to the first semiring, in consequence of this disposition. The *pessulus* is a well-marked, forwardly-directed

linear process, formed only by the right half of the last tracheal ring, which is thus like the antepenultimate, incomplete for a part of its course. The first bronchial semirings are much thickened and strongly arched: they are nearly in contact in front in the middle line, and are separated by but a narrow space from the last tracheal ring; behind they become incurved and thickened. The second bronchial semiring is the slenderest of all; it is shorter than the first or third, and slightly concave downwards. There is the same pseudo-ring formed, apparently by accumulation of tissue inside, between it and the first semiring as already described in *Eurylæmus*, but it is not so apparent here. The third semiring is much longer, being the longest of all the semirings, and in consequence projecting at both extremities. It is nearly straight, narrow, but not so narrow as the second ring, dilated behind and tapering slightly towards the front. The first, second, and third semirings of each side are nearly in contact with each other before and behind. The fourth ring has much the same shape as the third, but is slightly shorter, and more concave upwards than that one. The intervals between the second and third and third and fourth rings are somewhat deeper than are the rings themselves. The fifth and succeeding rings take on the usual form of bronchial semirings, gradually becoming more complete. As in *Eurylæmus*, the single intrinsic tracheal muscle, which is very slender, is inserted slightly behind the middle of the first bronchial semiring.

The *Eurylæmidæ* are therefore, as is evident from this description, Mesomyodian<sup>1</sup>, in that respect agreeing with most of the other "Formicarioid" Passeres of Wallace (*Ibis*, 1874, p. 406). It is probable that the existence of an intrinsic muscle in the syrinx of *Corydon sumatranus* escaped the notice of Johannes Müller—always supposing that in that species the same essential form of syrinx occurs as in those above described—owing to its slenderness. They are *not* Tracheophone; and in that they possess the sciatic, instead of the femoral artery<sup>2</sup>, they differ from the *Pipridæ* and *Cotingidæ*, with which they have so often been associated. From these, too, they differ, as they do from the *Tyrannidæ*, *Pittidæ*, and *Rupicola*, in the details of their syrinx as well as in the simple manubrium sterni and other points. As has already been stated, they differ from all the other Passeres in the retention of a vinculum in the deep flexor tendons of the foot. To the general bearing of these facts on the classification of the Passeres, I hope to return on some future occasion.

<sup>1</sup> Garrod, P. Z. S. 1876, p. 517.

<sup>2</sup> Cf. Garrod, P. Z. S. 1876, p. 516.

## 4. Contributions to the Anatomy of Passerine Birds.—

Part III. On some Points in the Structure of *Philepitta*, and its Position amongst the Passeres. By W. A. FORBES, B.A., F.L.S., Prosector to the Society.

[Received April 15, 1880.]

The doubt which has hitherto prevailed amongst ornithologists as to the true affinities of the very singular Malagash bird for which Geoffroy founded his genus *Philepitta*<sup>1</sup>, makes a knowledge of its anatomy, and particularly of its osteology and syrinx, a desideratum. Its original describer considered this genus most nearly related to *Philedon*. Bonaparte, in his *Conspectus*<sup>2</sup>, referred *Philepitta* with some doubt to the Starlings (*Sturnidæ*), placing it near *Dilophus*. The late Mr. Gray, in his *Hand-list*<sup>3</sup>, made it a genus of *Pittidæ*, *Pitta* being the only other genus of that family recognized by him.

Mr. Sharpe in 1870<sup>4</sup> suggested that it ought to be regarded as an aberrant genus of the *Paradiseidæ*, forming a subfamily which he proposed to call *Philepittinæ*.

That neither this position nor those assigned to it by Geoffroy or by Bonaparte can be accepted is evident from the fact that, as shown by Sundervall<sup>5</sup>, *Philepitta* possesses a long 10th ("first"<sup>6</sup>) primary, at the same time that the tarsus is *not* bilaminate. The Swedish naturalist last mentioned made his subfamily *Paictinæ* (he having rechristened *Philepitta* *Paictes*) the first in the fifth cohort, "*Tawa-spideæ*," of his "*Oscines Scutelliplantares*," the others being the *Thamnophilinæ*, *Myrmornithinæ*, *Hpysibæmoninæ*, and *Scytalopodinaæ*, in which last *Menura* was also included—a striking illustration of the unsatisfactory results that a classification founded on external characters only always leads to.

More recently, M. Alphonse Milne-Edwards has figured the two known species of *Philepitta*, as well as the tongue and osteology of *P. castanea*, in Grandidier's magnificent work on Madagascar<sup>7</sup>. In this work (the plates only of the part in question having been issued) he places it next to the *Nectariniidæ*, apparently on account of the eye-wattle of the male and the bifid tongue approximating it to such a form of that group as *Neodrepanis*. Having written to M. Milne-Edwards to ask if he had examined the syrinx or other soft parts of the bird under discussion, he was kind enough to reply by sending me the viscera, including the trachea &c., of a specimen (in all probability *P. castanea*), and by generously granting me permission to make any use of them I liked. He also informs me that in the text to the plates he has fully described the osteology.

<sup>1</sup> Mag. Zool., Ois., pl. 3, 1839.

<sup>2</sup> *Op. cit.* p. 422.

<sup>3</sup> *Op. cit.* i. p. 297, gen. no. 1094.

<sup>4</sup> P. Z. S. 1870, p. 397.

<sup>5</sup> Tentamen, p. 63.

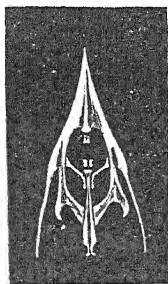
<sup>6</sup> See P. Z. S. 1879, p. 256, note.

<sup>7</sup> Hist. Phys. Nat. et Polit. de Madagascar, tome iii. Oiseaux, Atlas ii. 1<sup>re</sup> partie, pls. 109–112.



As regards this part of the structure of *Philepitta*, I only wish to remark on and give a figure of the palate, extracted from a skin of *P. castanea* by Prof. Garrod, M. Milne-Edwards's figure of this (pl. 112. fig. 2a) being rather indistinct in some important points. As will at once be seen, the vomer is truly Passerine, being split behind and truncated in front; to its outer and anterior angles are articulated two small nodules of bone, probably corresponding to the "septo-maxillaries" of Prof. Parker. The maxillo-palatines are slender, long, recurved apically, and pointed backwards; the transpalatines are distinct and slightly curved inwardly, and the palatines tend to diverge behind. In *Pitta* (*cyanura*) the vomer is proportionally broader, the maxillo-palatines are much shorter and broader and more transversely directed, and the palatines are nearly parallel to each other throughout<sup>1</sup>. In the *Eurylæmidæ*<sup>2</sup> the maxillo-palatines, though slender, are nearly transverse to the axis of the skull, and the "transpalatines" tend to become obsolete.

Fig. 1.

Palate of *Philepitta castanea* (nat. size).

Judging from M. Milne-Edwards's figure (*l. c.* pl. 112. fig. 3), the manubrium sterni is but slightly bifid, therein approaching that of the *Eurylæmidæ*.

As regards other points, in its pterylosis *Philepitta*, which was one of the few important forms unexamined by Nitzsch, is perfectly Passerine. There is a longish oval ephippial saddle, with a large space, much as in some of the *Eurylæmidæ* (*vide suprâ*, p. 381); in *Pitta*, according to Nitzsch, the saddle is undivided. But *Philepitta* differs from the *Eurylæmidæ*, and agrees with all other Passeres, in the absence of any vinculum in the deep plantar tendons, as was ascertained by Prof. Garrod from the examination of a skin, and recorded by him in MS.

<sup>1</sup> Cf. Prof. Parker's fig. of *Pitta melanocephala*, Trans. Zool. Soc. ix. pl. lvi. figs. 6, 7. In this species the "transpalatine" processes are far less developed than in *P. cyanura*.

<sup>2</sup> Figures of the palates of *Eurylæmus ochromelas* and *Calcyptomena viridis* are given in Prof. Garrod's paper, P. Z. S. 1877, p. 449.

As regards the alimentary canal, there is nothing peculiar. The tongue, in the specimen forwarded from Paris, was removed: but, as we know from M. Milne-Edward's figure, it is triangular and bifid at the end. There is no crop developed; and the zonary proventriculus is half an inch deep. The stomach is a strong gizzard, rather elongated in shape, with thick and considerably plicated epithelium. The liver is unequiloined, the left lobe being half the size of the right; it has a gall-bladder. The total length of the intestines is seven inches, of which the last half-inch is large intestine. The cæca are truly passerine, being mere nipples, and rather widely separated.

The syrinx of *Philepitta* being hitherto entirely unknown, I herewith give a description and figures of it.

Fig. 2.

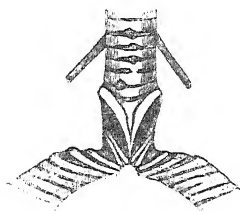


Fig. 3.

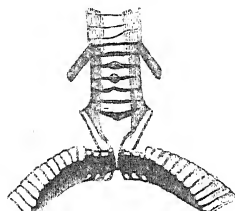


Fig. 4.



Fig. 2. Syrinx of *Philepitta*, from before. Fig. 3. The same, from behind.

Fig. 4. The same, from the right side. (These figures are magnified about 4 times.)

The trachea is slightly laterally compressed below; the rings, which are complete, are somewhat irregular in shape, owing to the greater or less development of the notchings on their borders. In front, of the last few rings preceding the terminal one, two or more are joined together by vertically directed bars, which makes it difficult to count their number with exactitude. Behind, however, they are all free. The terminal tracheal ring is narrow laterally, and closely apposed to the first bronchial semirings; in front and behind it is produced downwards triangularly, and behind bears a well-developed forwardly directed narrow pessulus. As seen from behind, therefore, the terminal tracheal ring has somewhat the shape of an arrow-head. The narrow sterno-tracheales are inserted on about the last ring but six. The first bronchial semirings are thickened, and very much arched, being concave downwards. As seen from the side (fig. 4) they are more strongly convex anteriorly than posteriorly. The second and third semirings are very slender indeed, closely approximate, much shorter and much less concave downward, so that a large membranous fenestra is left between them and the first semirings. The fourth and fifth semirings are also slender, but less so than the last two: they are slightly concave upwards, so that

a second, though shallower, fenestra is formed between them and the second and third pairs. The fifth semirings are slightly dilated at their extremities, where they are in close proximity, before and behind, with the first four pairs. The sixth and succeeding bronchial rings take on the ordinary character, being deeper than those that precede them, and gradually becoming more complete, till the fifteenth pair are nearly perfect. On one side, the left, in this specimen, the eighth and ninth semirings are partially fused externally..

The lateral muscles of the trachea, after the insertion of the sternotracheales, become excessively thin, so that it is difficult to make out accurately their exact extent. They apparently fan out, so as to be nearly in contact with each other before and behind, and are inserted onto the first bronchial semirings for the greater part (as far as I can make out) of their *lateral* surface, the *tips*, however, being quite free from muscular fibres.

*Philepitta* is therefore perfectly Mesomyodian, as Prof. Garrod predicted would probably be the case<sup>1</sup>.

There are thus three families of Mesomyodian Passeres in the Old World—the *Pittidæ*, the *Philepittidæ*, and the *Eurylæmidæ*. All agree in the possession of a broncho-tracheal syrinx, in that respect agreeing with the *Cotingidæ* (including *Rupicola*), *Pipridæ*, and *Tyrannidæ* of the New World, and differing from the Tracheophone families, which are all, as is well known, American. *Philepitta* differs in the details of its syrinx from all the other "Haploophone" Passeres. In *Pitta* (cf. P.Z.S. 1876, pl. 53. figs 1-6) the bronchial semirings are much less modified, being nearly entirely simple semirings; the lateral muscle, too, is slender and not spread out as in *Philepitta*. This fact, taken with others, as the scutellation of the tarsi, osteology, &c., justifies, in my mind, the establishment, as has been done by Sundevall under the name *Paictidæ*, of a separate family for the bird under consideration<sup>2</sup>. The *Eurylæmidæ* differ in their retention of a plantar vinculum (cf. Garrod, P.Z.S. 1877, and *suprà*, p. 382), as well as in the structure of their feet and other points. In the form of their syrinx, however, they approach *Philepitta* perhaps more nearly than any form yet described, though in them too the lateral muscle remains slender and unexpanded. The peculiarities of the *Eurylæmidæ*, and especially their oft-spoken-of retention of the plantar vinculum, are sufficient, I think, to justify their forming a main division of Passeres by themselves, as suggested by Prof. Garrod<sup>3</sup>, which may be termed *DESMODACTYLI* in distinction from the others or *ELEUTHERODACTYLI*. Prof. Garrod's arrangement of Passeres<sup>4</sup> may therefore be modified as follows:—

<sup>1</sup> Voice-organs of Passeres, p. 68.

<sup>2</sup> The general myology and vascular system of *Philepitta* are still, it must be remembered, unknown, but are in all probability perfectly Passerine.

<sup>3</sup> Voice-organs of Passeres, p. 73 and P.Z.S. 1877, p. 449.

<sup>4</sup> P.Z.S. 1876, p. 518.

PASSERES.	i. DESMODACTYLI. (The plantar vinculum retained; manubrium sternei not forked.)	New World.	Old World. <i>Eurylamiæ</i> .
	ii. ELEUTHERODACTYLI. (The plantar vinculum lost; manubrium generally strongly forked.)		
	A. Mesomyodi.		
	HETEROMERI.	<i>Pipridæ</i> . <i>Cotingidæ</i> .	
	HOMŒOMERI <sup>1</sup> .		
	Haploophonæ.	<i>Tyrannidæ</i> . <i>Rupicola</i> .	<i>Philepittidæ</i> . <i>Pittidæ</i> .
	Tracheophonæ.	<i>Dendrocolaptidæ</i> . <i>Furnariidæ</i> . <i>Pterotochidæ</i> .	
	B. Acromyodi.		ABNORMALES. <i>Atrichidæ</i> . <i>Menuridæ</i> .
			NORMALES.

Till more material has been examined, it is impossible to say whether or not some of the points in the above classification fairly express the affinities of the various groups treated of. This appears to me particularly the case as regards the primary division of the Mesomyodi into Hetero- and Homœomeri, depending as it does on the presence of the femoral or the sciatic artery respectively.

The pseudo-schizorhinal character of the skull also in some of the Tracheophonæ<sup>2</sup> may necessitate an ultimate arrangement of that group different from that here adopted (taken from Messrs. Sclater and Salvin's 'Nomenclator').

As regards the Passeres whose anatomy still remains unknown, the forms that most require examination are *Phytotoma* and *Oxyrhamphus*<sup>3</sup> of the New, and *Orthonyx* and *Melampitta* of the Old World. The last may be, as suggested by Mr. Gould<sup>4</sup>, a link between *Pitta* and *Philepitta*; Count Salvadori<sup>5</sup> on the other hand, is inclined to regard it as a Timeliine and therefore a normal (Oscine) Acromyodian form. It is also highly desirable to obtain some knowledge of the soft parts of some of the larger forms usually placed amongst the *Cotingidæ*, especially *Ptilochloris* and *Phœnicocercus* (placed by Sundevall with *Rupicola*), as well as of *Gymnoderus*, *Querula*, *Cephalopterus*, &c.

<sup>1</sup> I place *Philepitta* only provisionally amongst the Homœomeri, presuming that, as in all Passeres but the *Pipridæ* and *Cotingidæ* (minus *Rupicola*), the artery of the leg is the sciatic.

<sup>2</sup> Cf. Garrod, P. Z. S. 1877, p. 452, &c.

<sup>3</sup> Very imperfectly described by Eytton and Eydoux and Souleyet, cf. Joh. Müller, Stimmorgane, &c., p. 8.

<sup>4</sup> B. New Guinea, pt. ii. (1876).

<sup>5</sup> Ann. Mus. Civ. Gen. x. p. 147.

## 5. On a new Entomostracon from Afghanistan.

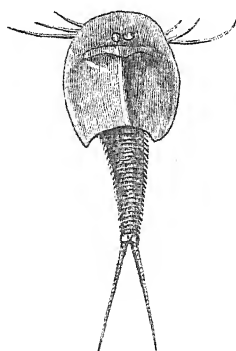
By FRANCIS DAY, F.Z.S.

[Received April 13, 1880.]

Among the zoological specimens kindly collected for me by Dr Duke in Afghanistan are several examples of a beautiful Entomostracon, which were captured in a pond near Kelat in April 1877. I propose to call it

*APUS DUKIANUS*, sp. nov.

Superiorly the general colour of the carapace is olive, the spinous projections sienna, and the body and tail dull yellow. The largest example is 1.4 inch long, 0.6 inch in width, while the caudal appendages are 0.7 inch in length. The longest appendage to its front feet or rami 0.5 inch in length. The caudal portion of the

*Apus dukianus.*

body is twice as long as the carapace. The segments of the body have each a transverse row of from 6 to 8 short spinous elevations directed backwards, the lateral spine being that most developed. The joints of the caudal appendage are similarly but less strongly armed to those of the body. The entire extent of the semilunar notch at the posterior extremity of the carapace is armed with very fine and short needle-like points, all being of about the same size; while under the microscope the hind portion of the carapace's outer edge is also seen to be minutely and evenly armed with fine points.

The great comparative length of the body of this species distinguishes it from known forms of *Apus*, while its carapace is relatively smaller and armature less developed. I have named it after Dr. Duke, who transmitted the species to me.

6. On Mammals from Ecuador. By OLDFIELD THOMAS, F.Z.S., Assistant in the Zoological Department, British Museum.

[Received April 19, 1880.]

(Plate XXXVIII.)

The collection to which this paper chiefly refers was brought from Ecuador by Mr. Clarence Buckley, together with a large number of birds and other animals obtained by him during his four years' residence in that country. It consists of 141 specimens, belonging to 38 species. The specimens are all in an excellent state of preservation; and a nearly complete set has been selected for the British Museum. I have also included in my notes a small collection from the same region received by the British Museum from Mr. Illingworth, containing 12 specimens belonging to 10 species—the total number of species being thus increased to 41.

The collection only contains one undoubted new species, *Bassariyon alleni*, an animal especially interesting both by its being the only known specimen of the genus which shows the external characters, and also by the remarkable instance of mimicry which it exhibits. Two of the Squirrels are also interesting as forming the long-expected links between *S. æstuans*, L., and *S. griseogenys*, Gray.

On the whole this collection confirms the correctness of the views expressed by Messrs. Newton and Salvin on the division of the Neotropical Region into subregions, as published in the new edition of the 'Encyclopædia Britannica.'<sup>1</sup> In their opinion the eastern part of Ecuador belongs to the Amazonian subregion; and we therefore find in this collection a very great preponderance of Amazonian forms, with a few species belonging to other subregions, such as *Mycetes niger*, which is a South-Brazilian type, *Tapirus roulini*, a Sub-Andean, and *Cariacus rufinus*, the range of which, according to Sir Victor Brooke<sup>2</sup>, extends from Guatemala to Ecuador.

The only papers hitherto published on the Mammals of Ecuador, so far as I am aware, are those by Mr. Tomes<sup>3</sup>, referring to the specimens obtained by Mr. Fraser at Gualaquiza and Palatanga. These papers, however, deal almost entirely with the Chiroptera and Rodentia, in which orders Mr. Buckley's collection is especially deficient, so that I am unable to draw any comparisons between the two.

The localities and dates at which the collections were made were as follows:—

Sarayacu<sup>4</sup>, on the Bobonasa river, Upper Pastaza river.

Copataza river, about 50 miles S.E. of Sarayacu, a tributary of the Pastaza. The specimens from this locality were obtained between December 1877 and February 1878.

<sup>1</sup> Vol. iii. p. 744.

<sup>2</sup> P. Z. S. 1878, p. 925.

<sup>3</sup> P. Z. S. 1858, p. 546; 1860, pp. 211 & 260.

<sup>4</sup> This must not be confounded with the far larger and better known Sarayacu on the Ucayali in Peru.

Andoas, on the Pastasa river, 70 miles below Sarayacu. September 1878.

Intac, 50 miles N. of Quito. July 1877.

Pallatanga, 50 miles S.W. of Riobamba.

Balzar, on the Palenque river, 70 miles north of Guayaquil.

The specimens from Balzar were collected by Mr. Illingworth, all the remainder by Mr. Buckley.

1. MYCETES SENICULUS, Linn.

Seven specimens from the Copataza river.

2. MYCETES NIGER, Geoffr.

*M. niger* (mas) and *M. stramineus* (fem.), Geoffr. Ann. Mus. xix. p. 108.

*Simia caraya*, Humboldt, Recueil, p. 255, no. 11.

One specimen from Intac.

This Intac specimen, of which, unfortunately, the sex cannot be determined, agrees exactly with Humboldt's original description of the female of his *Simia caraya*, which he describes as having a black head and back, while the sides and belly are yellow. In all recent descriptions, however, the male is described as being nearly uniformly black, and the female uniformly yellow; but this appears to be just such an intermediate specimen as Humboldt has described. On the other hand Prof. Schlegel<sup>1</sup> mentions that adult males sometimes have the black on the hands and feet mixed with yellow; so that, if our specimen is a male, it may represent merely an extreme phase of this variation.

*Mycetes palliatus*, to which this specimen bears a certain resemblance, is only found in Central America<sup>2</sup>, and differs in the length of the hair and in the detailed distribution of the colours.

3. LAGOTHRIX INFUMATA, Spix.

Five specimens, Copataza river.

4. NYCTIPITHECUS TRIVIRGATUS, Humb.

Five specimens, Copataza river.

5. PITHECIA MONACHUS, Humb.

Nine specimens, Copataza river.

6. CALLITHRIX CUPREA, Spix.

Twelve specimens from the Copataza river, and one from Andoas.

The Andoas specimen, which is a male, differs from the rest in having the fur on the back of a dirty orange-grey colour, without annulations, instead of being of a bright annulated black and white. One of the others, a female, shows a tendency to this condition of the hair, which is therefore very probably a seasonal change, as the Andoas specimen was shot in September, while the others were obtained between December and February.

<sup>1</sup> Monogr. Singes, p. 149.

<sup>2</sup> Cf. Alston, Biol. Cent. Am., Mamm. p. 4.

## 7. CHRYSOTHRIX SCIUREA, Linn.

Seven specimens, Copataza river.

Of the four adult specimens of this species, two are males and two females. The males are of the normal coloration; but the females both have a distinct black line along the side of the crown, above each ear, and extending in front down the side of the face nearly to a level with the angle of the mouth; and in one of them the two lines are connected across the neck by a third.

This agrees very well with the description of *C. lunulata*, Geoffr.<sup>1</sup> (*C. nigrivittata*, Wagn.<sup>2</sup>), a species founded entirely on specimens with similar black lines. Dr. Gemminger, of the Munich Academy; has most kindly examined for me the types of Wagner's *C. nigrivittata*; and he tells me that the series consists of two males and a female; so that these lines are not attributable to sexual difference, as I at first suspected. Dr. Gemminger at the same time states his opinion that *C. sciurea*, *C. nigrivittata*, and *C. entomophaga* form but one variable species. I am informed by Mr. Buckley that all his specimens were collected at the same place, and that the Indians consider them to be of the same species, and think the black lines to be merely a sign of old age.

Without further material I do not venture to give a decided opinion as to the validity of *C. lunulata* as a species; but it certainly is suspicious that the localities from which it has been recorded are not close together, but are scattered over the wide range of *C. sciurea*.

## 8. MIDAS ILLIGERI, Puch.

Twenty-one specimens, Copataza river.

All these specimens agree in having the fur across the shoulders and loins of a rich reddish chestnut-colour, thus differing from the next species, which has the hair on the same parts annulated with black and yellow.

## 9. MIDAS NIGRIFRONS, Geoffr.

Six specimens, Copataza river.

## 10. HAPALE PYGMÆA, Spix.

Six specimens, Copataza river.

## 11. THYROPTERA TRICOLOR, Spix.

One specimen, Sarayacu.

## 12. MOLOSSUS ABRASUS, Temm.

One specimen, Sarayacu.

## 13. PHYLLOSTOMA HASTATUM, Pall.

Two specimens, Sarayacu.

## 14. CAROLLIA BREVICAUDA, Wied.

Three specimens, Sarayacu.

<sup>1</sup> Archiv. Mus. iv. p. 18, 1844.

<sup>2</sup> Abh. Münch. Akad. v. p. 461.



15. *ARTIBEUS (URODERMA) BILOBATUS*, Peters.

One specimen, Sarayacu.

There can be little doubt as to the correctness of this determination, although the specimen has been dried, and therefore does not show the characters of the nose-leaf very well; but the dimensions agree nearly exactly with those given by Dr. Peters<sup>1</sup>, and there are three molars in each jaw, as in the subgenus *Uroderma*. The jaws are rather more elongated than is usual in *Artibeus*, and in this respect resemble those of *Vampyrops*; but the form and direction of the upper incisors prove that it is undoubtedly an *Artibeus*.

16. *FELIS PARDALIS*, Linn.

Two immature specimens, Sarayacu.

17. *FELIS TIGRINA*, Erxl.

Two specimens, adult and young, Andoas.

These Tigercats belong to the variety which has been till lately known as *F. macroura*, Wied.; but Mr. Elliot<sup>2</sup> and Mr. Alston<sup>3</sup> have now decided that it is not specifically separable from the earlier-known *F. tigrina*.

[*MUSTELA PUTORIUS*, Linn.

One specimen, Pallatanga.

This is of course merely a Polecat which has been used for ferretting, and has made its escape from captivity.]

18. *GALICTIS BARBARA*, Linn.

Two specimens, Sarayacu.

19. *PTERONURA SANDBACHII*, Gray.

One specimen, Sarayacu.

This Otter's skin exactly agrees with Gray's type of the species, a half-grown specimen from Demerara. It is a very remarkable thing that this species should be found in Ecuador, 1500 miles from its only hitherto known habitat, on an entirely different river-system; but I can find no characters by which to separate the Ecuador form. The specimen is a flat skin, without skull; but it shows clearly the three external points by which *Pt. sandbachii* differs from all other Otters, viz. the corded margins to the tail, the extension of the hair on the nose-pad to the absolute edge of the nostrils, and the yellowish-white irregular blotches on the throat. Prof. Reinhardt<sup>4</sup> has stated his opinion that this species, or one closely allied to it, inhabits the province of Minas Geraes, South-east Brazil. If this be the case, it would show that this Otter is very widely distributed over Tropical South America, instead of being restricted to Guiana as was formerly believed.

<sup>1</sup> MB. Ak. Berl. 1865, p. 587.

<sup>2</sup> P. Z. S. 1877, p. 704.

<sup>3</sup> Biol. Centr. Am., Mamm. p. 61.

<sup>4</sup> P. Z. S. 1869, p. 57.

20. *NASUA RUFA*, Desm.

Two specimens from the Copataza river, and one from Balzar.

21. *BASSARICYON ALLENI*, n. sp. (Plate XXXVIII.)

One adult female from Sarayacu.

This is by far the most interesting animal contained in the collection, as the genus has been hitherto known from a single skull only, collected by Prof. Gabb in Costa Rica, and now in the collection of the Smithsonian Institution, the skin of which has been accidentally mislaid<sup>1</sup>. This skull Mr. J. A. Allen, in the 'Proceedings of the Philadelphia Academy' for 1876, described under the name of *Bassaricyon gabbi*, and figured it most carefully; so that, on comparing the skull of our specimen with his figures, I was at once able to see that it was undoubtedly congeneric; there were, however, so many differences in detail as, combined with the difference in locality, to necessitate its separation as a distinct species. This I take the liberty of naming after the founder of the genus, to whom every student of the Mammalia owes a heavy debt of gratitude for the work he has done among the North-American representatives of that class.

In its external characters our specimen presents a most extraordinary resemblance to the common Kinkajou (*Cercoleptes caudivolutus*); in fact, if the skull had not been taken out of the skin here, so that no doubt could exist as to their belonging to one another, no one could have believed that it was any thing but a rather small specimen of that animal.

The body and tail are orange-grey, the hairs of the back being tipped with black; the belly is of the same colour, but lighter. The face and crown are covered with short whitish hairs tipped with black, the black tips being longer towards the occiput. The resulting clear grey of the face is the only distinction in colour from the Kinkajou, that animal having the face coloured like the body. The tail is long, covered with long woolly hairs, many of which show a distinct golden lustre. From the appearance of the fur it seems probable that the tail is not prehensile (as it is in the Kinkajou). The fur all over the body, like that on the tail, is rather longer and more woolly than that of the Kinkajou. The mammae are two in number, situated about  $2\frac{1}{2}$  inches from the anus.

The skull is nearly exactly the same size as that of *B. gabbi*, and has the same general proportions; but the following differences are observable:—(1) The upper outline of the skull in *B. gabbi* is regularly convex, but in *B. alleni* the frontal region is flattened from the crown to the nasals; thus the perpendicular height of the skull from the front edge of the alveolus of the last molar to the frontal profile (fig. 2, *a* to *b*) in *B. gabbi* measures 1 inch, in *B. alleni* only 0·9 in. (2) In the side view of the skull in *B. gabbi* the frontal profile shows distinctly above the supraorbital process and ridge, while in *B. alleni*

<sup>1</sup> By an unfortunate mistake Mr. Allen was led to figure in the Proc. Phil. Acad. for 1877 the skin of the Central-American Coati (*Nasua nasica*) as that of his *Bassaricyon gabbi*; but he has since explained the error.

the latter appear to be quite at the top of the skull. (3) In the same view the upper edge of the middle of the zygoma is nearly

Fig. 1.

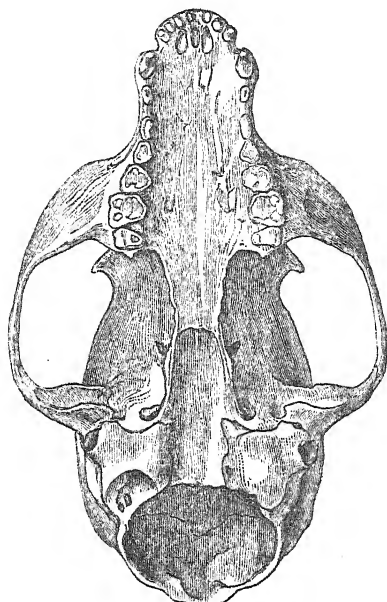
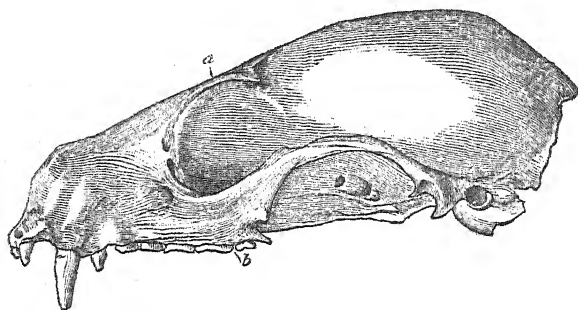
Skull of *Bassaricyon alleni*.

Fig. 2.

Upper jaw of *Bassaricyon alleni*.

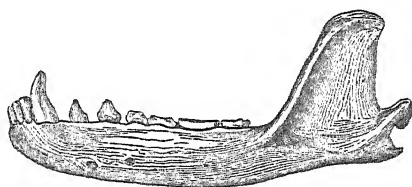
horizontal in *B. gabbi*, while it is evenly convex in *B. alleni*. (4) Seen from above, the zygomata are nearly parallel in *B. gabbi*, but

they slightly diverge behind in *B. alleni*. (5) The last upper molar, instead of being subquadrate, as long as it is broad, and nearly as large as the first, is subtriangular as in *Procyon*, much broader than long, and considerably smaller than the first molar, as shown in the table of measurements. (6) The top of the coronoid process of the lower jaw (see fig. 3) is different in shape from that of *B. gabbi*; and in the latter the angular process is further from the condyle than in *B. alleni*.

When the external characters of *B. gabbi* are described, I feel quite sure that further points of difference will be found between these two forms from such very distant localities as Costa Rica and Ecuador.

The skull of *Bassaricyon* is so absolutely different from that of *Cercoleptes* that Mr. Allen did not think of comparing the two; and I fully agree with him in thinking this animal more nearly allied to *Procyon* and *Nasua* than to any of the other Procyonidæ, though in size it is more similar to *Bassaris*.

Fig. 3.



Lower jaw of *Bassaricyon alleni*.

The external resemblance of this species to *Cercoleptes* certainly seems to be an instance of mimicry, which, so common among insects, is somewhat rare among Mammalia. It is, however, very difficult to understand how being mistaken for *Cercoleptes* could in any way benefit *Bassaricyon*; but when more of the habits of the latter are known we may hope to be able to guess at the true use of the likeness.

Mr. Buckley unfortunately did not take any especial notice of the habits of this animal, as both he and the Indians thought it to be merely the common Kinkajou. It is much to be hoped that more specimens of this interesting genus will be found; and I would draw the attention of collectors and others to the only external means of distinguishing it—namely, the flatness of the head and the greyness of the face as compared with the high head and yellowish face of the Kinkajou.

## Measurements in inches and tenths :—

	in.
Length, head and body .....	16·0
Length of tail .....	19·0
Tip of nose to eye .....	1·4
„ „ ear .....	2·6
Length of skull, from occiput to end of præmaxillæ .....	3·17
Greatest breadth.....	2·0
Distance between orbits .....	·65
Width at orbital processes .....	1·10
Front of præmaxillæ to tip of orbital processes .....	1·64
Length of upper molar series.....	·90
Length of lower jaw .....	2·10
Size of upper molars :—	Length. Breadth.
First .....	0·17 0·19
Second .....	0·21 0·20
Third .....	0·12 0·18

22. *CERCOLEPTES CAUDIVOLVULUS*, Pall.

One specimen from Sarayacu of the ordinary character, and two from Balzar with remarkably short tails, the tails being about 11 inches long only, while the head and body in both measure about 16 inches. The skulls of these specimens are quite of the normal type ; so that the shortness of their tails must be merely owing to individual variation.

23. *TAPIRUS ROULINI*, Fisch.

*T. ecuadorensis*, Gray.

Two young specimens, Sarayacu.

Mr. Buckley had obtained a fine series of about fifteen or sixteen adult specimens of this Tapir ; but, unfortunately, before the skins were prepared, a troop of native revolutionary soldiers put in an appearance and cut off the hoofs of every specimen to make into amulets, so that the whole series of skins was perfectly useless for scientific purposes. Mr. Buckley was so vexed at this misfortune that he did not even care to prepare the skulls, which would have formed a very interesting set.

24. *CARIACUS (COASSUS) RUFINUS*, Puch.

Four specimens, three adults and one young, Sarayacu.

25. *CARIACUS (COASSUS) NEMORIVAGUS*, F. Cuv.

Four specimens, two adult and two young, Sarayacu.

26. *SCIURUS STRAMINEUS*, Eyd. & Soul.

One male specimen, Balzar.

27. *SCIURUS ÆSTUANS*, Linn.

Two specimens from Intac, and one from Balzar.

Under the heading of *S. griseogenys*, Gr., Mr. Alston, in his late

review of the Neotropical Squirrels<sup>1</sup>, says, in reference to the distinctness of that species from *S. æstuans*, "That connecting links may yet be found seems very probable; but I have not been able to find such in the very large series I have examined, and am consequently compelled to keep them provisionally distinct." Now these two *Intac* specimens seem to me to be just such intermediate specimens as Mr. Alston refers to. *S. griseogenys* is separated from *S. æstuans* by having its belly and the tips of the tail-hairs of a rich orange or rufous, while the same parts in *S. æstuans* are white or pale yellow, and also by its larger size. One of the *Intac* specimens is very like typical *S. æstuans*, having the belly white and the tail-hairs tipped with yellow; but it is considerably larger than the average size of that species, and on the sides of the chest and the middle of the tail there is a tendency to a reddish coloration. The specimens collected by Mr. Fraser at Gualaquiza and referred to by Mr. Tomes<sup>2</sup>, seem to have been somewhat of this character; those from Pallatanga, on the other hand, were typical *S. griseogenys*<sup>3</sup>. The other specimen is far more like this latter species, as all along the sides of the belly the fur is a rich orange-rufous, and the tips of the tail-hairs are of the same colour; so that this specimen only differs from *S. griseogenys* by having the throat and centre of the belly white, as in *S. æstuans*. The Balzar specimen is a typical *S. griseogenys*.

It was quite to be expected that the links between these two species would be found in Ecuador, as *S. æstuans* ranges over Bolivia, Eastern Peru, Brazil, and Guiana, while *S. griseogenys* is found in Colombia, Venezuela, and Central America.

*S. griseogenys* may still be considered a very well marked variety, and should stand as *S. æstuans*, var. *hoffmanni*, Dr. Peters having described it under this varietal name in 1863<sup>4</sup>, while Dr. Gray's *S. griseogenys* dates only from 1867<sup>5</sup>.

## 28. CÆLOGENYS PACA, Linn.

A single skull, Sarayacu.

## 29. HOLOCHILUS, sp.

An albino Rat from the Balzar Mountains is referable to this genus; but its size and proportions do not agree with those of any of the hitherto described species of *Holochilus*. Without seeing normally coloured individuals, however, I do not feel justified in describing it as new, as there are numerous species of South-American so-called *Mus* and *Hesperomys* which have been described merely on external characters, without reference to the skull, by which alone the correct genus of a murine animal can be determined.

<sup>1</sup> P. Z. S. 1878, p. 667.

<sup>2</sup> P. Z. S. 1858, p. 547.

<sup>3</sup> P. Z. S. 1860, p. 213.

<sup>4</sup> Monatsb. Ak. Berl. 1863, p. 654. Mr. J. A. Allen, provisionally accepting the distinction of the form in his paper (Bull. U.S. Geol. & Geogr. Surv. iv. p. 885), called it *Sciurus hoffmanni*, Ptrs

<sup>5</sup> Ann. & Mag. N. H. ser. 3, xx. p. 419.

30. *CHOLÆPUS HOFFMANNI*, Peters.

A young skin and skeleton from Balzar, showing clearly the presence of only six cervical vertebræ, and six specimens from Sarayacu. There is also a skin from the latter place which appears to be referable to *C. didactylus*, Linn.; but, without seeing the skeleton, I hesitate to state for certain that the two species are found together in the same locality. One of the Sarayacu skulls shows scarcely a trace of the usual inflation of the pterygoids; the absence of this inflation in certain species of the Three-toed Sloths caused Dr. Gray to separate the genus *Arctopithecus* from *Bradypus*<sup>1</sup>; but this instance of its absence among the Two-toed Sloths shows that it is not a character which can be relied upon for generic distinction.

31. *BRADYPUS INFUSCATUS*, Wagl.

A series of seven specimens from Sarayacu, and one from Balzar. The specimens show well the extraordinary amount of variation that occurs among the Sloths, there being no two skulls or skins exactly alike. The Balzar specimen has the soft straight hair on the face extending on the head to a distance of  $2\frac{1}{2}$  inches from the tip of the nose; no other specimen that I have seen has this hair extending more than to just above the eyes, a distance of about one inch. There is, however, nothing special about the skull of this specimen.

32. *PRIODONTES MAXIMUS*.

*Dasyppus maximus*, Kerr, Linn. Syst. Nat. p. 112, 1792<sup>2</sup>.

*Dasyppus giganteus*, Et. Geoff. & Cuv., Cat. Mamm. Mus. d'Hist. Nat. p. 207, 1802.

*Dasyppus gigas*, Cuv. Règne Anim. i. p. 221, 1817.

Two specimens from Sarayacu.

33. *TATUSIA KAPPLERI*, Krauss.

Two specimens, Sarayacu.

This species, like *Pteronura sandbachii*, was hitherto only known from the Surinam region. These two specimens, however, agree exactly with those which the British Museum received some years ago from Dr. Krauss himself, except that one of them has a fifth claw on the fore as well as on the hind feet. The genus *Tatusia* has normally the rudimentary bones of a fifth toe on the fore feet; so that the occasional development of a fifth claw was quite to be expected.

34. *TATUSIA NOVEDECINCTA*, Linn.

*Tatusia peba*, Desm.

One specimen from Sarayacu.

35. *XENURUS LUGUBRIS*, Gray.

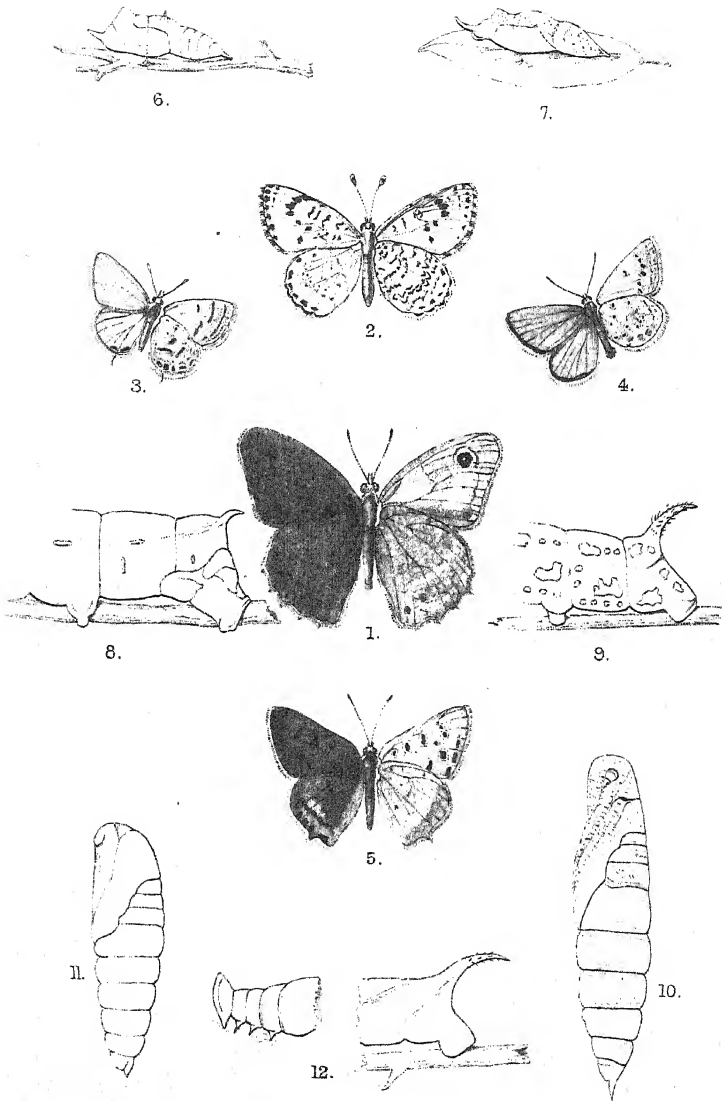
One specimen from Sarayacu.

<sup>1</sup> P. Z. S. 1849, p. 69.

<sup>2</sup> Cf. Ann. & Mag. N. H. ser. 5, iv, p. 396, 1879.







## 36. MYRMECOPHAGA JUBATA, Linn.

One specimen from Sarayacu.

## 37. TAMANDUA LONGICAUDATA, Wagn.

One specimen, Sarayacu.

## 38. CYCLOTHURUS DIDACTYLUS, Linn.

Four specimens from Sarayacu, and one from Balzar.

## 39. DIDELPHYS DERBIANA.

*Didelphys derbiana*, Waterh. Naturalist's Libr. xi. p. 97, pl. 2.

*Didelphys ornata*, Tschudi, Fauna Peruana, p. 146, pl. 7.

A male from Sarayacu, and a male and female from Balzar.

The Balzar specimens are of a very pale reddish colour, while the Sarayacu one is of a dark reddish grey; but the Museum series shows every stage between the two.

## 40. DIDELPHYS CINEREA, Temm.

A male and female from Sarayacu.

## 41. DIDELPHYS MURINA, Linn.

One specimen from Balzar.

7. On a Collection of Lepidoptera from Candahar. By  
ARTHUR G. BUTLER, F.L.S., F.Z.S., Assistant Keeper  
Zoological Department, British Museum.

[Received April 20, 1880.]

(Plate XXXIX.)

The very interesting little series of Lepidoptera which forms the subject of the present paper was collected by Major Howland Roberts at Rokeran, a small village only about six miles from Candahar, on the river Urgundab (or "Argandab"). Major Roberts writes (date 9th January, 1880):—"I made no observation after the 2nd July, further than that I saw two species of *Macroglossa*, viz. *stellatarum* or one nearly allied, and one considerably larger.

"After the beginning of April no rain fell; and when I arrived at Rokeran about the end of April the country was dried up, except where irrigation came into play and a few moist spots in the barren hills. The only plants that were green in these hills during the summer months were chiefly milky plants such as *Euphorbia*, and a few other stunted ones, but no trees; consequently insects were comparatively rare.

"Along the dry bank of the river were little nullahs running into the river; these were kept moist from a small canal running above

and parallel to the bank : in these were a few living plants more or less green. In these nullahs I found no. 26 Butterfly, also nos. 8 and 23, where the food-plants of the larvæ were common. Not a single shower of rain fell from the beginning of April till the 20th December. The lucerne is grown in the young plantations of fruit-trees, and is watered from small canals which traverse the whole cultivated portion of the country." In a letter (dated 15th January) he adds :— " It is *not* curious that I have got so few specimens, the reason being that my hunting-grounds were extremely limited. There is every reason to believe we shall go towards Ghuznee this summer, and probably start about the end of February or beginning of March ; and I expect that will be a far better part of the country than this, there being no forest or even scrub jungle of any kind here, the only trees being fruit-trees, with a very few exceptions. The war appears only just to be commencing ; so I cannot form an idea when I shall get out of the country : the worst of it is, it is not safe to go even a few yards from quarters without being well armed, and to go any distance at all, even a few miles, is very unsafe without an escort ; so that there is not much pleasure in being in a country like this." " I collected very few eggs here—only those of the common and Red-backed Shrike, a small Dove which built its nest on the rocks, a crested Lark (extremely abundant), a ' chikor' (a red-legged Hill-partridge), and one or two others ; I am afraid I shall have even a worse opportunity this year of finding any. I can do nothing where I am at present : I gave up collecting Butterflies last year earlier than I should have wished to, owing to cholera breaking out here rather severely, as the sick were put in the places I was in the habit of frequenting. I visited the hills close by ; but after 1st of July they were so dried up that only a few common butterflies were to be found ; moths I caught very few of, owing to being unable to go outside the walls after dusk, and there being no flowers of any kind near to attract them."

" I don't think I ever mentioned to you that there was a silkworm common at Jutogh on mulberry. It was very like the common silkworm so well known in England (*B. mori*) ; but (I am sorry to say I made no description of it at the time) it was light brown, and had a good many long fleshy projections over the body (some perhaps a quarter of an inch long). The silk was very like that of the common one, a beautiful golden colour, and quite as good, if not better. There was no difficulty whatever in winding off the silk ; and it was extremely strong. In 1876 it was common and double-brooded ; but in 1878 I only observed one brood. In 1877 I was in Cashmir, where, in a mulberry orchard, I found one crawling up my tent."

In a subsequent letter Major Roberts forwarded careful sketches of the larvæ of some of the species obtained by him, of which he had already forwarded descriptions, together with notes on habits, date of capture, and, so far as he could ascertain, the distribution of the insects obtained by him, all which information I have incorporated in the present paper.

*List of the Species.*

## RHOPALOCERA.

## NYMPHALIDÆ.

## 1. DANAIS CHRYSIPPUS ♀ (no. 7).

*Papilio chrysippus*, Linnæus, Mus. Lud. Ulr. p. 263 (1764).

"Common everywhere in June; less common and battered in May."

## 2. DANAIS PLEXIPPUS (no. 19).

*Papilio plexippus*?, Linnæus, Mus. Lud. Ulr. p. 264 (1764).

"Saw one specimen, but failed to catch it."

## 3. HIPPARCHIA PARISATIS (no. 15).

*Satyrus parisatis*, Kollar, Denkschr. Akad. Wien, math.-nat. Cl. i. p. 52. no. 7 (1850).

"When fresh and in the sun the white border is shot with brilliant blue. Frequents nullahs and shady places, and may be caught by dozens at a time. Abundant but local at the end of May, and in June in shady, moist places among the low, rocky, barren hills."

## 4. HIPPARCHIA THELEPHASSA (no. 10).

*Eumenis thelephassa*, Hübner, Samml. exot. Schmett. ii. pl. 85 (1816-24).

"Very common at the beginning and middle of May in the nullahs and on the rocky slopes at the foot of the hills, resting under the shade of rocks and stones during the heat of the day, and flying about in the early morning and evening, when it is easily captured. In June scarcely a specimen was to be found."

## 5. EPINEPHELE ROXANE (no. 20).

*Epinephele roxane*, Felder, Reise der Nov. Lep. iii. p. 491. no. 849, pl. 69. figs 12, 13 (1867).

"Found commonly at the end of May and in June in company with the two species of *Hipparchia*, but lasting longer than *H. thelephassa*."

This species although nearly allied to *E. davnendra*, differs in its paler coloration and the more deeply sinuated margin of the secondaries.

## 6. EPINEPHELE INTERPOSITA (no. 14). (Plate XXXIX. fig. 1.)

♀. *Epinephele interposita*, Erschoff, Lep. Turk. p. 22. no. 68, pl. 2. fig. 16 (1874).

"This appears to be rather rare, but is most probably common in other localities or seasons. I found one male in the middle of May, and one female at the end of May: the sexes are very much alike."

Major Roberts forwarded the male only, for identification: it is much like a small *E. pallescens* ♂ on the upper surface; but below all the brown areas are replaced by whitish, and there are two minute obliquely-placed ocelli near the anal angle of the secondaries as in *E. hispulla*.

7. PYRAMEIS CARDUI (no. 3).

*Papilio cardui*, Linnæus, Faun. Suec. p. 276. no. 1054 (1761).

"Common, but not at all abundant; larva found on different species of thistles; at Jutogh I have found it on the common artichoke and occasionally on the mallow. June and July. Might probably be very common later on in the season."

8. MELITEA ROBERTSI, sp. n. (no. 12). (Plate XXXIX. fig. 2.)

Allied to *M. didyma*; coloration and general aspect above more like *M. perseæ*: bright fulvous; wings with the fringe white spotted with black, these spots united at their bases by a black line; a marginal series of black spots alternating with the spots on the fringe: primaries with the ordinary black markings on the basal half and the usual zigzag series of prominent black spots; four minute black subapical dots: secondaries with a few scattered black scales in the cell and an angular series of seven black dots beyond the middle; no trace of the ordinary series of submarginal lunules. Under surface paler than in *M. didyma*, the black markings much smaller, the submarginal series of spots in the primaries reduced as above to four subapical dots (the last two geminate): secondaries with both black and red spots reduced in size, the series of spots placed ordinarily halfway between the two red bands closely approximated to the series which bounds the inner edge of the outer band and continued across the wing, so as to make a series of slightly interrupted annular markings; the series usually bounding the outer edge of the same red band only represented by a few black scales. Expanse of wings 1 inch 6 lines.

"Rather common on the bare uncultivated wastes at the foot of the hills at the end of May and beginning of June. I found one chrysalis, but not the larva; the chrysalis was loose in the middle of a low plant."

LYCENIDÆ.

9. LAMPIDES RETICA (no. 6).

*Papilio bæticus*, Linnæus, Syst. Nat. i. 2, p. 789. no. 226 (1767).

"Common everywhere in April, May, June, &c.; varies extremely in size."

10. LAMPIDES CONTRACTA, sp. n. (Plate XXXIX. fig. 3.)

♂. Glossy lilac above, the body dark grey, with the head and sides of abdomen white, antennæ black annulated with white: wings with slender black marginal line, fringe white; base of wings bluish; costal border of primaries pale bluish from the base to the end of

the cell; secondaries with brownish costal border; two black spots, the inner one bifid, above the tail, succeeded by a slender white line; tail black tipped with white. Wings below very pale whitish-brown, with a white-bordered pale brown elongated spot at the end of each cell, followed by a discal series of similar spots, interrupted in the secondaries; a marginal series of white and brown ocelloid spots of the usual form: secondaries with three black spots above the tail at anal angle, the two outer ones large, zoned with orange and varied with metallic golden green, the outermost spot extremely small; two subcostal black spots and a third within the cell: body below white. Expanse of wings  $11\frac{1}{2}$  lines.

♀. Wings above pale brown, with a slender black marginal line followed by a brown line; fringe white; primaries washed towards base of interno-median area with silvery blue; secondaries with a series of six ocelloid spots close to outer margin—the first indistinct, the first four brown with white borders, the fifth large, black, with orange inner and white outer border, the sixth bifid, black with bluish inner and white outer border; tail black, tipped with white; body browner than in the male; under surface slightly browner than in the male; otherwise the same. Expanse of wings 10 lines.

“Rare in May, very common in June, not so variable in size as *L. batiscus*, and much smaller.”

Allied to *L. cnejus*, but constantly smaller and of an entirely different colour, the upper surface of the male being altogether blue and the under surface whiter; the female is also paler; the pattern of the under surface is very like that of *L. galba* as figured by Lederer. Mr. Moore has a series of *L. contracta* from Kutch.

#### 11. *LYCÆNA PERSICA* (no. 5).

*Lycæna icarus*, var. *persica*, Bienert, Lep. Ergeb. p. 29 (1870).

Allied to but distinct from *L. icarus*; the fringe shorter; the secondaries more produced at apex: the male below chalky white, all the black spots extremely small, the marginal ocelloid spots scarcely visible, those of the primaries showing no trace of orange, those of the secondaries with small pale orange lunules along their inner margins; the female with greyish costal border on the upper surface of the primaries and with the greater part of the wing behind this washed with blue, the secondaries broadly washed with blue in the same manner; the orange submarginal spots well separated on both primaries and secondaries. The wings below whitish-brown with all the black spots smaller, the primaries with two additional spots towards the base; the orange on the submarginal spots very pale and restricted: both sexes with very little blue or green at the base of the wings below. Expanse of wings, ♂ 1 inch 2 lines, ♀ 1 inch 4 lines.

“Abundant in April, May, and June.”

#### 12. *LYCÆNA BRACTEATA* sp. n. (no. 18). (Plate XXXIX. fig. 4.)

♂. Allied to *L. argus*, with which it agrees on the upper surface: below considerably paler, with all the black spots much smaller and

distinctly white-bordered, the orange spots wholly absent from the primaries, and the orange borders of the secondaries only represented by small ochreous lunules above the metallic spots, the latter silvery green with black centres instead of margins, extremely small towards the apex, but increasing in size towards the anal angle. Expanse of wings 1 inch 1 line.

♀. Of a more pinky lilac colour than the male; the primaries with a considerably broader, but brown instead of black, border; a well-defined black discocellular stigma; secondaries with brown costal border; outer margin black preceded by five or six rounded blackish spots: wings below altogether paler than in the male; but the example is evidently not a fresh one, so that this character may be due to fading. Expanse of wings 1 inch 1 line.

“Found in May, and common in June.”

The female is utterly unlike that sex of *L. argus* on both surfaces, being in coloration almost like a male insect.

### 13. *SCOLITANTIDES CASHMIRENSIS* (no. 11).

*Scolitantides cashmirensis*, Moore, Proc. Zool. Soc. 1874, p. 272.

“Very common here at the end of May and in June, but was rather local in Cashmir.”

### 14. *CHRY SOPHANUS STYGIANUS*, sp. n. (no. 4). (Plate XXXIX. fig. 5.)

♂. Smoky brown: primaries in certain lights shot with fiery copper; spotted with black as in *C. timeus* (*eleus*? Fabr.); two small orange spots beyond the interrupted black discal series: secondaries with a slender undulated deep-reddish-orange band on a black ground near the outer margin; above it a series of four or five pale blue hastate spots, and above these again beyond the end of the cell two black dots; a black dash at the end of the cell; fringe greyish white: body blackish. Wings below very like *C. timeus*, but considerably paler, the submarginal black spots of primaries less distinctly white-bordered; the apex and outer margin of primaries and the ground-colour of the secondaries very pale grey. Expanse of wings 1 inch 4 lines.

♀. Larger than the male, the primaries with the outer third of the cell and the subapical area bright orange, the black spots larger, otherwise similar: below slightly yellower in tint all over, so that the ground-tint of the secondaries has a pale brownish rather than greyish hue. Expanse of wings 1 inch 5 lines.

“Common in April and May, abundant in June.”

This species is considerably larger than *C. phlovas*, and has the costal margin of the primaries longer.

## PAPILIONIDÆ.

### 15. *COLIAS HELICHTHA* (no. 24).

*Colias helichtha*, Lederer, Verh. zool.-bot. Ges. ii. p. 33 (1823).

“This I should have at once put down as only a variety of no. 2

(*C. pallida*), but for the fact that I have never taken it at Jutogh or elsewhere. I caught several specimens in the lucerne gardens here, owing to their being very conspicuous; but they are rare compared with the above species: April, May, and June. A few specimens have less orange and more nearly approach no. 2."

In Kirby's Catalogue this species is regarded as a variety of *C. erate*; but Dr. Staudinger hazards the suggestion that it may be a hybrid between *C. erate* and *C. edusa*; unfortunately for the latter view, *C. edusa* does not exist at Candahar.

16. *COLIAS ERATE* (no. 2).

*Colias erate*, var. ♀ *pallida*, Staudinger, Cat. Lep. Eur. p. 3. no. 54 (1861).

"This and no. 21 (*C. sareptensis*) are found here throughout the year, and are both abundant in June in lucerne fields. I was unable to find the larvæ of any of the *Colias*."

Major Roberts has sent both *white* and *yellow* females of this species. He states also that the female is "yellow or white;" otherwise I should have suspected it to be a local race of the European form.

17. *COLIAS SAREPTENSIS* (no. 21).

*Colias hyale*, var. *sareptensis*, Staudinger, Cat. Lep. Eur. p. 5. no. 48 (1871).

Major Roberts says, "This is in some cases very difficult to distinguish from no. 2, as I have caught the sexes together which appear to represent ♂ no. 2 and ♀ no. 21; and often I am unable to distinguish the sexes in no. 21." From this observation I should think it likely that the female form to which Dr. Staudinger has given the name of *pallida* is a hybrid between *C. erate* and *C. sareptensis*<sup>1</sup>.

18. *TERACOLUS FAUSTUS* (no. 26).

*Papilio fausta*, Olivier, Voy. l'Emp. Oth. Atl. pl. 33. figs. 4a, b. (1801).

"Caught seven or eight specimens, all males, along the dried-up bank of the river, between the 20th June and 2nd July. Probably the females would have appeared in July; but I was unable to go out after them."

19. *BELENOIS MESENTINA* (no. 8). (Plate XXXIX. fig. 6.)

*Papilio mesentina*, Cramer, Pap. Exot. iii. pl. 270. figs. A, B (1782).

"Rare in April, but abundant in June." The examples sent were taken at the end of June.

Major Roberts sends the following description of the larva and pupa:—"Larva 118. About 1" long. Back and sides smooth and

<sup>1</sup> Major Roberts has sent sexes of both species taken *in coitu*; one sent as "no. 21" is certainly a yellow female of "no. 2," and *vice versa* with a white female sent as "no. 2."



shiny, covered with minute yellow warts (dots); hairy over the feet and extreme segments; soft, short, and whitish hairs. A broad yellowish-green dorsal band with a darker green pulsating dorsal stripe. A dark brown or blackish lateral band, in which the yellow dots are conspicuous, giving it a grey appearance. Spiracular stripe green, more or less dirty-looking. Head and thirteenth segment black with yellow dots. Belly and feet green. Posterior segments slightly attenuated. Head slightly larger (when crawling) than second segment, but about the same size as third segment."

"Rokeran, end of June; gregarious and abundant on a species of caper with shining green leaves and thorns, and fruit resembling a minute melon.

"*Pupa* in June. Yellowish white, speckled with yellow and black dots."

## 20. SYNCHLOË DAPLIDICE (no. 9).

*Papilio daplidice*, Linnæus, Syst. Nat. i. 2, p. 760. no. 77 (1767).

"Frequents cultivated ground and gardens; common in June."

Major Roberts doubts the identity of this species with *S. daplidice*, because of its agility as compared with those which he has previously taken in India. He says, "It is not a sluggish insect, quite the reverse, as it settles suddenly on a flower and is as suddenly off again, and not nearly so easy to capture as no. 1." This, however, is precisely the habit of *S. daplidice* as I have seen it in the Rhone valley; I found it less easy to capture than *Colias hyale*, so that after a morning's hard work, I had only succeeded in boxing three specimens.

## 21. SYNCHLOË IRANICA (no. 23). (Plate XXXIX. fig. 7.)

*Pieris iranica*, Bienert, Lep. Ergebn. p. 27 (1870).

*Pieris vipasa*, Moore, Proc. Zool. Soc. 1872, p. 565.

"Frequents the rocky uncultivated slopes of the hills where the food-plant of the larva grows. This species is common in June."

"*Larva* 112. About 1" long. General colour pale green, with longitudinal yellow bands and black dots; thickest in the middle, slightly tapering at both ends; has a rough appearance from being ribbed, and is covered with minute hairs. Dorsal and lateral bands dull green, the black dots giving it a blue appearance. Subdorsal band yellow. Spiracular band white, yellow at the junction of the segments. Head pale green with black dots; a yellow patch on each side, a whitish collar on second segment. Belly pale green. Feet pale green with a yellow mark above each. Spiracles indistinct.

"Candahar, middle of May, June; on a wild mignonette growing on the rocky hills and slopes.

"*Pupa* attached to the stem or leaf of its food-plant by the tail and also by a thread over the back. A beak-like proboscis turned upwards and rather long."

22. *GANORIS MANNII* (no. 1).

*Pontia mannii*, Mayer, Stett. ent. Zeit. 1851, p. 151.

"Found throughout the year, very common in June. I have not met with this in any part of India." The pair sent to me were taken *in coitu*.

## HESPERIIDÆ.

23. *ERYNNIS MARRUBII* (no. 17).

*Hesperia malvarum*, var. *marrubii*, Herrich-Schäffer, Schmett. Eur. i. Hesp. figs. 14, 15 (1845).

"Occurs in May, and common in June." The specimen sent home was taken at the beginning of July.

"*Larva* 116. About 10''' long; thickest in the middle, rather attenuated at each end; sluggish and wrapped up in a leaf.

"Skin soft, but with ribbed and irregular surface and covered with very short and minute whitish hairs. General colour dull (dusty) green; dorsal line green, very fine and only visible on a few of the front segments. Head large, globular, slightly indented at the top, deep black (like charcoal), much larger than several segments which follow; second segment smaller than head or third segment and forming a black neck or collar with three large yellow spots on it. Subdorsal stripe of a paler green than the ground-colour, but rather dull; spiracular, slightly raised or projecting flesh from the sides. Rokeran, Candahar, end of June; wrapped up in the leaves of the mallow, on which it feeds.

"*Pupa*, wrapped up in a leaf, tightly webbed in and fastened by the tail only. Colour, brown washed with white."

## SPHINGIDÆ.

24. *CHÆROCAMPA CRETICA*. (Plate XXXIX. fig. 8.)

*Deilephila cretica* ♀, Boisduval, Ann. Soc. Linn. Paris, 1827, p. 118. pl. 6.

"The larva of this species was exceedingly common on the vine (which is largely cultivated here) end of May and June. It is closely allied to one found at Jutogh and in Kashmir on the wild balsam, but is distinct; the moth of this species is, I think, of a much paler colour on the front wings. Out of over 100 larvæ which I examined I could not find one black variety (of course they turn brown just before changing), while in the other species the larva is as often black as green, so far as my experience goes. Every specimen of this changed in about two to three weeks after becoming a chrysalis, while with the Kashmir (balsam) one they all remained through the winter in the pupa state."

"*Larva* 113. About 3'' long, at rest; anterior segments attenuated and retractile. Robust, skin soft and smooth.

"Horn very short, slightly curved, pale mauve or purple, pink at tip. General colour green (agreeing with the underside of the vine-leaves), speckled with pale yellow. A thread-like green dorsal line; a pale yellow subdorsal stripe, meeting the one on the opposite side

at the base of horn. A subdorsal row of eye-spots, each consisting of a green patch in a yellow oval, the first spot on the 5th segment being the largest and most distinct, those on each following segment becoming smaller, more flattened, and less distinct till lost on the 12th segment, sometimes becoming indistinct after the 7th or 8th segment: these spots are only distinct as eye-spots on the 5th and 6th segments, that on the 6th being flatter than that on the 5th, those on the remaining segments appearing like dashes while the larva is green, but more like eyes on its changing colour<sup>1</sup> when well fed; spiracles brown or dull pink; head, feet, belly, all green, rather darker than the back; the yellow at the bottom of the eye-spots takes part in the subdorsal stripe.

"*Pupa*, end of May and June: at the surface of the ground, under dead leaves, rubbish, &c. Often in a green leaf turned over and united by a few threads of silk, or between two leaves joined in a similar way.

"*Imago*, middle of June. About 2 or 3 weeks in the pupa state. All my specimens changing the same year."

25. *DEILEPHILA ROBERTSI*, sp. n. (Plate XXXIX. figs. 9, 10.)

♀. Primaries above much elongated (more than in *D. tithymali*); chalky-white, with a snow-white basal spot, the markings consisting of a large oblong subbasal patch, the costal border, a very large subcostal patch beyond the cell (with a rectangular excision out of the infero-exterior portion), and a broad discal belt tapering towards the apex bright olive; the second and third median veins white externally; external border very slightly tinted with lilacine, but scarcely perceptibly; a black spot close to base of internal border: secondaries black with brown costal border, a dull rose-red discal belt commencing on the abdominal border in a large snow-white patch, as in *D. hippophaes*; external border pale flesh-tint, fringe white: body olive, sides of head and thorax, margins and fringe of tegulae, antennae and anterior margins of abdominal segments snow-white; the three basal segments snow-white at the sides, the two basal ones with the white area interrupted by large velvety-black spots. Under surface pale sandy greyish with a paler discal belt on the wings; primaries with a blackish nebula just beyond the cell; secondaries with a few blackish scales towards the anal angle. Expanse of wings 3 inches 1 line.

On the upper surface of the primaries this species most nearly resembles *D. dahlii*, of the secondaries *D. hippophaes*, of the body *D. esulae*, and on the under surface *D. lathyrus*: the olive tint of the thorax and the markings on the primaries is greener than in any species with which I am acquainted.

"The larva of this was found on almost every plant of a species of *Euphorbia* which is very common on the rocky hills here: the larvæ are very beautiful and conspicuous, and are very different in colouring according to their different stages of growth. It is quite

<sup>1</sup> Viz. to a dark brown.

"*Pupa*, beginning of May. Forms its cocoon by uniting the leaves of its food-plant together with a white silk.

"*Imago*, end of May."

Major Roberts sends notes on several species which, owing to their rarity, he has not forwarded to me; of one of these (a small blue butterfly) he sends a pencil sketch; but it would be impossible, either from a rough representation or the short notes which accompany the numbers, to ascertain with any certainty the correct names of the species.

#### EXPLANATION OF PLATE XXXIX.

- Fig. 1. *Epinephele interposita* ♂, Ersch., p. 405.  
 2. *Melitæa robertsi* ♂, Butl., p. 406.  
 3. *Lampides contracta* ♂, Butl., p. 406.  
 4. *Lycæna bracteata* ♂, Butl., p. 407.  
 5. *Chrysophanus stygianus* ♂, Butl., p. 408.  
 6. *Belenois mesentina*, Cram, pupa, p. 409.  
 7. *Synchlœë iranica*, Bien., pupa, p. 410.  
 8. Hind segments of larva of *Cherocampa cretica*, Boisd., p. 411.  
 9. Hind segments of larva of *Deilephila robertsii*, Butl., p. 412.  
 10. Pupa of *D. robertsii*.  
 11. Pupa of *Eusmerinthus kindermanni*, Lederer, p. 413.  
 12. Front and hind segments of larva of *Eusmerinthus kindermanni*.

#### 8. Further Additions to the Marine Molluscan Fauna of South Australia, with Descriptions of new Species. By GEORGE FRENCH ANGAS, C.M.Z.S., F.L.S., &c.

[Received April 20, 1880.]

(Plate XL.)

Several months ago I received from Professor Ralph Tate, of the Adelaide University, a small collection of marine shells obtained by him (mostly from shell-sand) on various beaches in St. Vincent's and Spencer's gulfs. Amongst these the following species occur which have not hitherto been recorded as having been met with in the Province of South Australia :—

1. PURPURA ANOMALA, Angas, P. Z. S. 1877, p. 34.

The type specimens were dredged outside Port-Jackson Heads, New South Wales.

2. NASSA LABECULA, A. Ad. St. Vincent's Gulf (*Tate*).

3. NASSA LIRELLA, Beck. St. Vincent's Gulf (*Tate*).

4. CLATHURELLA RUFOZONATA, Angas, P. Z. S. 1877, p. 38. Port Jackson.

5. *CLATHURELLA BICOLOR*, Angas, P.Z.S. 1871, p. 18. Port Jackson.

6. *DAPHNELLA FRAGILIS*, Reeve. Aldinga Bay (*Tate*).

7. *RISSOINA CRASSA*, Angas, P. Z. S. 1871, p. 17. Port Jackson.

8. *TORNATINA BRENCHELEYI*, Angas, P. Z. S. 1877, p. 40. Outside Port-Jackson Heads.

9. *LAPELLARIA OPHIONE*, Gray. Moreton Bay and New Zealand.

The species described below appear new to science.

10. *CLATHURELLA CRASSINA*, n. sp. (Plate XL. fig. 6.)

Shell stoutly fusiformly turreted, solid, whitish, tinged with chestnut at the base of the aperture; whorls 7, rounded and somewhat flattened above, longitudinally strongly nodulously ribbed, and sculptured transversely with numerous fine thread-like striæ; aperture subovate; outer lip thickened, flattened, and variced externally, dentate within; canal short, slightly recurved; posterior sinus rather broad, above which there is a small chestnut-coloured spot.

Alt.  $4\frac{1}{4}$ , diam. 2 lines.

*Hab.* Aldinga Bay, St. Vincent's Gulf (*Tate*).

11. *GLYPHOSTOMA PAUCIMACULATA*, n. sp. (Plate XL. fig. 7.)

Shell fusiformly turreted, solid, white tinged with brown above the sutures, and with three or four irregular dark-chestnut line-like spots near the periphery of the last whorl and on the columella; whorls 6, with about eight stout somewhat nodulous longitudinal ribs, crossed by smaller transverse ridges that become larger at the back of the outer lip and towards the base; aperture narrowly ovate; outer lip flattened and variced externally, slightly sulcate within; columella with six transverse elevated ribs or ridges; canal a little produced; posterior sinus rather broad and shallow.

Alt. 4, diam.  $1\frac{1}{2}$  lines.

*Hab.* Aldinga and Holdfast Bays (*Tate*).

This curious shell belongs to the late Dr. Gabb's genus *Glyphostoma* (fam. Pleurotomidæ.).

12. *AMAUOPSIS GLOBULUS*, n. sp. (Plate XL. fig. 5.)

Shell rimate, globosely turbinata, rather thin, shining, orange horn-colour, much paler on the last whorl towards the aperture; whorls 4, convex, with two narrow concentric raised keels on the subapical whorl; last whorl very large, nearly smooth, with a few descending lines of growth, crossed here and there with exceedingly fine, delicate, close-set concentric striæ, visible only under the lens; aperture semilunar; outer lip thin, simple, arcuate; columella slightly thickened and expanded over the umbilicus.

Length  $2\frac{1}{2}$ , breadth 2 lines.

*Hab.* Holdfast Bay, in shell-sand.

13. *RISSOINA ELEGANTULA*, n. sp. (Plate XL. fig. 10.)

Shell elongately pyramidal, moderately solid, white; whorls 8, slightly convex, longitudinally closely and regularly finely plicate, the interstices (especially on the last whorl) crossed by fine liræ; sutures distinct; aperture subovate; outer lip thickened, and slightly sinuous at the base of the columella.

Diam. 1, alt. 3 lines.

*Hab.* Aldinga Bay, from shell-sand (*Tate*).

14. *RISSOINA LIRATA*, n. sp. (Plate XL. fig. 11.)

Shell elongately pyramidal, rather thin, dull milky white; whorls 7, a little convex, longitudinally sculptured with regular moderately distant ribs that become obsolete towards the centre of the last whorl, which is crossed between the periphery and the base with numerous very fine, close-set hair-like striæ; outer lip thickened and variced.

Length 2, breadth  $\frac{3}{4}$  of a line.

*Hab.* Holdfast and Aldinga Bays, in shell-sand.

15. *COLLONIA* (?) *ROSEOPUNCTATA*, n. sp. (Plate XL. fig. 8.)

Shell minute, narrowly and deeply umbilicated, globosely turbinate, solid, white, more or less dotted or flamed all over with bright rose-colour; whorls 4, convex, closely concentrically ridged throughout; aperture subcircular; peritreme a little thickened and contracted.

Diam.  $1\frac{1}{2}$ , alt.  $1\frac{1}{3}$  line.

*Hab.* Holdfast Bay, St. Vincent's Gulf; in shell-sand (*Tate*).

Were it not for its umbilicus, this minute shell in its general aspect closely resembles a *Collonia*. If the operculum, when discovered, proves to be calcareous, then its relationship to that genus will be more nearly established.

16. *ADEORBIS VINCENTIANA*, n. sp. (Plate XL. fig. 9.)

Shell depressedly conical, ovate, broadly umbilicated, moderately thin, semipellucid, white; whorls 3, rapidly increasing, the last very large, convex, finely undulately concentrically striated, obtusely keeled below the periphery, and with a basal keel surrounding the umbilical region, which is crossed by somewhat irregular rude lines of growth that become slightly crenate upon the keel; spire small, elevated; apex papillary; aperture semilunar; outer lip arcuate, simple; inner lip nearly straight, sinuously angled posteriorly.

Long. 3, lat.  $2\frac{1}{2}$ , alt.  $1\frac{1}{2}$  line.

*Hab.* Aldinga Bay, St. Vincent's Gulf (*Tate*).

About the same size as *Adeorbis angasi*, A. Ad., from Port Jackson, from which it differs both in form and sculpture.

9. Descriptions of three Species of Marine Shells from Port Darwin, Torres Straits, discovered by Mr. W. T. Bednall; and of a new *Helix* from Kangaroo Island, South Australia. By GEORGE FRENCH ANGAS, C.M.Z.S., F.L.S., &c.

[Received April 20, 1880.]

(Plate XL.)

*VOLUTA (AULICA) BEDNALLI* (Brazier). (Plate XL. fig. 1.)

Shell narrowly elongately ovate, solid, white, with four narrow transverse red or bright orange bands on the last whorl, the upper band close next the suture, the other three at equal distances down the whorl, which are crossed by about twelve similar, narrow, longitudinal, zigzag bands of the same colour, showing a tendency to spread into irregular spots between the second and third transverse bands; whorls 6, flatly convex, marked with fine longitudinal striæ or lines of growth, which are more prominent on the upper whorls; the last whorl more than two thirds the length of the shell; spire elevated, apex papillary and obtuse; aperture somewhat narrow, white within, columella nearly straight, furnished with four plaits, the two upper ones the largest and least oblique, the two lower ones very oblique; outer lip simple.

Length 3 inches 4 lines, diam. 1 inch 4 lines.

*Hab.* Port Darwin, Torres Straits, North Australia (*W. T. Bednall*).

This remarkable Volute differs from any other known species in its very singular style of painting, which gives it a latticed appearance, the brilliant red, narrow, zigzag descending bands crossing the straight transverse ones at right angles. Mr. Brazier, of Sydney, has already bestowed on this beautiful shell the name of its discoverer, Mr. W. T. Bednall; and I have much pleasure in retaining that name, and figuring it in the Proceedings of the Zoological Society of London.

*MUREX (PTERONOTUS) BEDNALLI* (Brazier). (Plate XL. fig. 2.)

Shell fusiform, rather thin, pale cream-colour, with three very broad, flattened, fin-shaped scabrous varices; whorls 8, sculptured with somewhat distant elevated transverse ridges that spread out and become more developed at the back of the varices, which are striped and tinged with brown, between which are very numerous close-set, fine, hair-like concentric striæ; spire prominent, apex pointed; aperture small, narrowly pyriform; columella slightly arched, smooth, shining, with a brown hollow tooth projecting forward at the base, and another longer one curving outwards and backwards at the junction of the middle varix with the canal; outer lip very broad and flat, with wide flattened grooves towards the outer edge, the interstices

of which are stained with dark brown; canal moderate, a little recurved and partly closed by the union of the two lips at their base.

Alt. 3 inches, diam. 2 inches.

*Hab.* Port Darwin, Torres Straits (*W. T. Bednall*).

Another very beautiful shell, belonging to the *Pteronotus* group of *Murices* (also discovered by Mr. Bednall, and provisionally named by Mr. Brazier), which I have great pleasure in figuring in the Society's 'Proceedings.'

*CLANCULUS BICARINATUS*, n. sp. (Plate XL. fig. 4.)

Shell umbilicated, turbinate, solid, very dark purplish brown; whorls 6, prominently keeled in the centre, the last whorl with two keels, one above and one below the periphery, sculptured all over with distinct separated rows of regular close-set bead-like nodules, those on the keels being double the size of those between them, the interstices crossed with fine oblique striæ; outer lip strongly dentate within, and surrounded by a row of black spots at the margin; columella nearly straight, with a small tooth-like projection at either end, the margin of the false umbilicus dentate, with an incurved tooth above, and crenate at the base, around the umbilical margin white; interior pearly white.

Alt. 6, diam. 8 lines.

*Hab.* Port Darwin, North Australia (*W. T. Bednall*).

This shell is remarkable from its having two strong keels on the last whorl, and also on account of its uniform dark-brown colour.

*HELIX (RHAGADA) BORDAENSIS*, n. sp. (Plate XL. fig. 3.)

Shell widely and deeply umbilicated, lenticular, moderately thin, very strongly and irregularly obliquely flexuously corrugated, the corrugations becoming larger and more elevated towards the middle of the whorls, cretaceous, white; spire depressed, apex obtuse; sutures very strongly impressed and crenated; whorls 5, nearly flat, the last depressed and strongly keeled above the periphery, not descending in front, slightly keeled around the umbilicus; aperture oblique, semilunar; outer lip simple; columella very slightly expanded; margins united by a thin callus.

Diam. maj. 8, min. 7, alt.  $3\frac{1}{4}$  lines.

*Hab.* Cape Borda, Kangaroo Island, South Australia (*W. T. Bednall*).

This remarkable shell exhibits a somewhat similar sculpture to *H. silveri*, Ang. (P. Z. S. 1868, p. 275), and *H. kooringsensis*, Ang. (P. Z. S. 1877, p. 33); but it differs from both those species in having the raised corrugations more numerous and elevated, displaying at the sutures and on the keel an elegant frilled appearance. It is also smaller, flatter, has a wide perspective umbilicus; and the corrugated ridges show here and there a tendency to bifurcate.

#### EXPLANATION OF PLATE XL.

Fig. 1. *Voluta (Aulica) bednalli*, p. 418.

2. *Murex (Pteronotus) bednalli*, p. 418.



- Fig. 3. *Helix (Rhugada) bordaensis*, p. 419.  
 4. *Clanculus bicarinatus*, p. 419.  
 5. *Amauropsis globulus*, p. 416.  
 6. *Clathurella crassina*, p. 416.  
 7. *Glyphostoma paucimaculata*, p. 416.  
 8. *Collonia roseopunctata*, p. 417.  
 9. *Adeorbis vincentiana*, p. 417.  
 10. *Rissoina elegantula*, p. 417.  
 11. — *lirata*, p. 417.<sup>2</sup>

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June 1, 1880.

Prof. W. H. Flower, LL.D., F.R.S., President, in the Chair.

Mr. Sclater made some remarks on the principal objects he had noticed during a recent inspection of the Zoological Gardens of Berlin, Hamburg, Amsterdam, The Hague, and Antwerp.

At Berlin there was a fine adult pair of the Large Indian Rhinoceros (*R. unicornis*) together, with a good prospect of their breeding in captivity. There was also, now quite adult, the young Rhinoceros imported by Mr. Jamrach in 1874, and said to have been obtained in the Munipore district, of which Mr. Sclater had spoken (in his paper on the Rhinoceroses living in the Gardens read before the Society in 1875<sup>1</sup>), as probably an example of *R. sondaicus*. In this conclusion he now thought he had been mistaken. The animal was much too large for *R. sondaicus*, and did not show the peculiar shoulder-fold that characterizes that species. He believed it to be merely *R. unicornis*.

In the Hamburg Gardens was a Chimpanzee (*Troglodytes niger*) that had been seven years there, and a fine pair of the Indian Tapir (*Tapirus indicus*), which had bred last year, although the young animal had unfortunately died. There was also what he believed to be an adult in full breeding-dress of *Pelecanus mitratus*, in which the naked space round the eye was orange, the breast tinged with yellow, and the nuchal crest full and pendent. In other respects the bird resembled a small *Pelecanus onocrotalus*. Amongst the Deer at Hamburg were a male, two females, and three young males of a fine large Stag allied to *C. elaphus*, from the Amoor district, which Dr. Bolau had proposed to call *Cervus luehdorfi*. The question was whether it was not *C. xanthopygus*, Milne-Edwards, Ann. d. Sci. Nat. sér. 5, tom. viii. p. 376 (1867). One of these it was hoped to obtain for the Society's collection.

At Amsterdam Mr. Sclater had observed in the Parrot-house an example of *Trichoglossus mitchelli* (the third specimen recorded of this well-marked species), and two living male Paradise-birds (*Paradisea papuana*), which had been some ten months in the collection. There was likewise a fine pair of *Otaria gillespii*.

In the Zoological Gardens at The Hague were likewise two Paradise-birds of the same species.

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<sup>1</sup> Trans. Zool. Soc. vol. ix. p. 650.

The Secretary exhibited a Spider of the genus *Tegenaria*, which had been forwarded to him from Cape Town with the following letter:—

Cape Town,  
April 9, 1880.

Dear Sir,—

I send per this post a registered package, containing a “Tarantula” Spider. I caught it within three miles of Cape Town, on the back of a horse. All here were very unwilling to touch it, owing to its deadly bite; but I, using chloroform, secured it. The mare has since died; and the effects produced by the bite are similar to St. Vitus’s dance in a human being. Trusting to hear of its safe arrival,

I remain, dear Sir,

Yours very faithfully,

J. H. PAYNE.

The Secretary stated that Mr. O. P. Cambridge, to whom he had submitted the specimen, had kindly examined the Spider, and had pronounced it to belong to an apparently new species of *Tegenaria*, closely allied to *T. guyoni*, a species common in London cellars.

Mr. Cambridge confessed to much incredulity as to the mare having died from the bite of this Spider, and said that, though no doubt the facts stated were correct so far as regards the Spider having been found on the back of the mare and the mare having subsequently died, he required very clear and good evidence besides to convince him that the two facts were related to each other as cause and effect.

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Mr. G. E. Dobson exhibited a new and remarkable species of *Megaderma*, proposed to be called *M. gigas*, sent from Queensland to the Göttingen Museum by Dr. Schuette.

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Lord Lilford exhibited and made remarks upon some specimens of hybrid Pheasants between males of *Phasianus reevesi* and hens of *P. colchicus* and allied species, remarkable for their size and beautiful plumage.

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The following papers were read:—

1. Note on the Distribution of the Crayfish (*Astacus*) in Spain. By E. W. H. HOLDSWORTH, F.L.S., F.Z.S., &c.

[Received April 20, 1880.]

In the valuable memoir by Professor Huxley on the Classification and Distribution of the Crayfishes, published in the ‘Proceedings’ of this Society (1879, p. 752), the author refers to the long-standing belief that the Crayfish is not to be found in the Spanish rivers; but he thought there was little doubt that it was to be met with about

Barcelona. It having been stated by some gentlemen who heard Professor Huxley's paper read, that Crayfishes were certainly supplied to the Madrid market, I was led to move some of my Spanish friends to make careful inquiries as to the localities whence these Madrid Crayfishes are obtained. The result showed that they are procured in considerable numbers at only a short distance from Madrid itself. The Crayfish appears to be unknown in the rivers Douro and Tagus, on the western side of the Peninsula, and in the Ebro on the eastern; but it is found abundantly in the Talegones and Escalote, rivulets forming part of the sources of the Douro, in the Henares, one of the sources of the Tagus, and in the upper part of the Jalon, an important tributary of the Ebro. Widely separated, however, as these three rivers become in their courses to the sea, both east and west, the rivulets I have mentioned as forming their principal sources all take their rise within an area probably not more than twenty miles square, situated nearly in the centre of Spain, and about forty or fifty miles north-east of Madrid. It is from these small streams that the Madrid market is supplied by fishermen of Alhama, Sigüenza, and Berlanga; and these streams are the only ones well within the borders of the Peninsula in which, so far as I can discover, the Crayfish is to be found. As before mentioned, Crayfishes are said to be found about Barcelona; but it may possibly turn out that they are really caught in the small streams which, rising in the Pyrenees, afterwards unite to form the river near which Barcelona stands. My correspondents tell me that they can obtain no information of the occurrence of the Crayfish south of Madrid; and they add that if they were known to be found there the markets of the capital would not be solely supplied from the northern streams, as is now the case. The peculiar localization of these crustaceans in the centre of Spain suggests the idea of their having been specially introduced; but experiments in acclimatization are, I believe, unknown in the Peninsula; and without attempting any explanation of the difficulty, I may simply record the fact that the Crayfish is abundant in the rivulets within the limited area I have mentioned.

2. Observations on the Characters of the Echinoidea.—III.  
On some Genera and Species of the *Temnopleuridæ*. By  
F. JEFFREY BELL, M.A., F.Z.S., Professor of Comparative  
Anatomy in King's College.

[Received April 24, 1880.]

(Plate XLI.)

For the purposes of present convenience I adopt the name *Temnopleuridæ* for those forms which are grouped under it by Prof. Alex. Agassiz in his 'Revision of the Echini.' I need not now de-

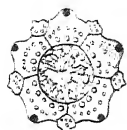


Fig. 4.

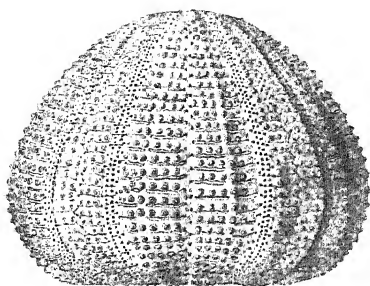


Fig. 1.

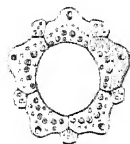


Fig. 3.

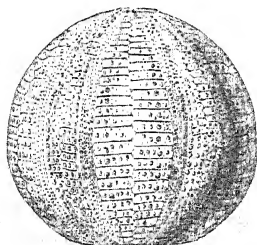


Fig. 5.

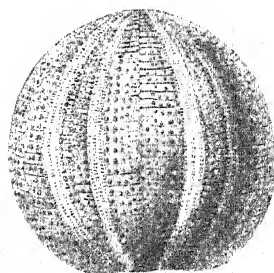


Fig. 6.



Fig. 7.

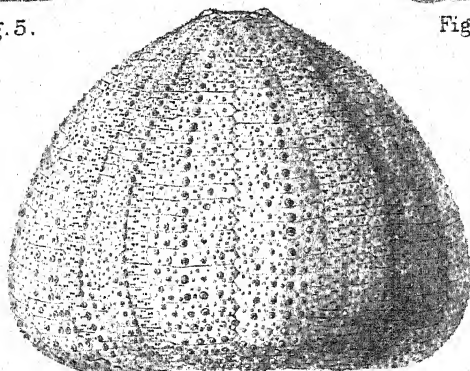


Fig. 2.



Fig. 8.



fine it in detail, but will say merely of it that it includes those forms which, with a varying arrangement of their ambulacral pores, are provided with more or less distinct sutural pores or pits at the angles of the coronal plates.

There is, perhaps, no group in which variations during growth are more remarkable than they are in this; there is certainly none in which they are more instructive. Following the method I have already adopted<sup>1</sup>, I have, in the tables of measurement which form the great body of this paper, expressed the absolute diameter of the tests in millimetres, while for the height, the abactinal system, the anal area, and the actinostome, the percentage values have been calculated; the poriferous zone is also occasionally added. Two recommendations present themselves for undertaking this exceedingly laborious task: the changes which occur during growth are at once seen; and, secondly, an aid is afforded to that not small group of naturalists who have not under their hands so large a series of forms as is fortunately to be found in our own national collection. Differences in proportion will not now form the chief ground on which new species are established; and the value of the British-Museum series will be hereby extended to those naturalists who, for want of such, are, naturally enough, led to regard their single immature specimen as the representative of a new species<sup>2</sup>.

#### I. TEMNOPLEURUS, Agassiz.

The type of this genus is *T. toreumaticus* (see Agassiz, Introd. to Valentin's Anat. du genre *Echinus*, p. vii, & Observations sur les progrès récents etc., 1841, p. 7).

Prof. Alex. Agassiz recognizes in the genus three species, the forms *T. reevesii* and *T. granulosus* of Gray being regarded as synonymous with *T. reynaudi*, Agass. I have carefully examined Dr. Gray's types, and have been led to the conclusion that the two are not representatives of the same species.

The name *Toreumatica*<sup>3</sup> is ordinarily regarded as a synonym of *Temnopleurus*; but it seems that Dr. Gray nowhere defined it, and it might well be allowed to fall out.

<sup>1</sup> P. Z. S. 1879, p. 662.

<sup>2</sup> It appears to me to be unnecessary to justify the selection, as a standard of the diameter of the test, of the *regular* Echinida. Save where abnormalities, easily enough detected, come to development, it seems plain that it stands in very much the same relation as the diameter of the human thorax does in measurements of this character, and is the nearest approach to that relation between the dimensions of the head and of the thorax which has been found so useful in the case of proportional measurements of the human subject (cf. Liharzik, 'Das Gesetz des Wachstums u. der Bau des Menschen,' Wien, 1862, p. 33).

<sup>3</sup> See P. Z. S. 1855, p. 39.

## 1. TEMNOPLEURUS TOREUMATICUS.

	Absolute diameter in millims.	Percentage value of			
		Height.	Abactinal area	Anal area.	Actino-stome.
i.....	9	61.1	33.3	15.5	44.4
ii.....	14.5	55.1	?	13.8	31
iii.....	27	50	22.2	11.1	29.6
iv.....	27.5	50.9	21.9	9.9	29.9
v.....	44	45.45	18.6	9	28.6
vi.....	47	40.4	19.1	8.5	28.7

This species is so well known that there is no need to delay over it.

## 2. TEMNOPLEURUS HARDWICKII.

	Absolute diameter in millims.	Percentage value of			
		Height.	Abactinal area.	Anal area.	Actino-stome.
i.....	7	57.14	30	14.28	42.8
ii.....	11	63.63	29	13.6	45.5
iii.....	24	50	22.08	9.6	33.3
iv.....	27.25	47.7	21.8	9.17	29.1
v.....	32	56.2	21.8	9.37	29.06
vi.....	43	60.4	20.93	9.02	26.7

With regard to the height, it would seem that it is not so much that changes occur in it during growth, as that there are considerable variations in it, with a tendency to a high form (63 per cent.) and a low form (47.7 per cent.).

## 3. TEMNOPLEURUS REYNAUDI.

As I have already pointed out, I believe that in the latest Revision two distinct species have been united under this head. Mr. Percy Sladen has given expression to a doubt on the subject<sup>1</sup>; and he informs me that the type of Dr. Gray's *T. granulosus* struck him as being "a good species" when, some time ago, he had the opportunity of examining it. *T. reevesii* of Gray does, however, seem to be synonymous with the *T. reynaudi* of Agassiz.

When the types of the two species are compared, we find that in *T. granulosus* the abactinal area is of moderate size and there is no specially large plate in the anal area; the connecting ridge of the auricles<sup>2</sup> is lower than in *T. reevesii*; the miliary tubercles are very numerous developed and surround the primary tubercles; sutural furrows, quite distinct from the pits of *T. reevesii*, occupy the middle

<sup>1</sup> J. L. S. xiv. p. 437.

<sup>2</sup> I feel inclined to attach a little more importance to this character than does Prof. Agassiz, who says of it that it is high, when he is defining the genus, and very low, when defining *T. hardwickii* (p. 461).

line of the interambulacral area; and though not so deep nor so wide as in *T. toreumaticus*, they extend almost to the base of the primary tubercles; on the other side of these tubercles there are narrower and shallower furrows; and in the middle line of the ambulacral area there are deep sutural pits: all these depressions are much more distinct above the ambitus than they are on the actinal surface, in which point they offer a striking point of difference from *T. reevesii*. The test is by no means thin; all the ocular plates are excluded from the anal area; the outermost, not the innermost, of the three tubercles on the interambulacral plates is the smallest.

The following are the more important measurements:—

	Diameter.	Height.	Abactinal area.	Anal area.	Actinostome.	Spine.
Gray's type..	37	18	8		10.5	
		[48.6] <sup>1</sup>	[21.6]		[28.3]	
	32	16.3	7.0	3.5	10.2	10.5 <sup>2</sup>
		[50]	[21.8]	[10.9]	[30.9]	

In other words *T. granulosus* differs from *T. reevesii* (i. e. *T. reynaudi*) in the facts that:—

- i. The abactinal area is not large; and the anal area is much smaller.
- ii. All the ocular plates are excluded from the anal area<sup>3</sup>.
- iii. There are sutural furrows and deeper angular pits.
- iv. The miliaries are much more numerously developed.
- v. There is no specially large anal plate.
- vi. The actinostome is a good deal smaller.

These differences appear to me to be sufficient to justify us in regarding Gray's *Toreumatica granulosa* as a distinct species; it is, however, obviously enough a member of the genus *Temnopleurus*.

The following is a table of the dimensions of *T. reynaudi* proper, the *T. reevesii* of Gray.

	Absolute diameter in millims.	Percentage value of			
		Height.	Abactinal area.	Anal area.	Actinostome.
i.....	7.1	46.5	38	17	40.8
ii.....	7.5	42.6	40	20	40
iii.....	10	42	31	15	33
iv.....	10.5		36.19	19	33.3
v.....	21	47.6	30.9	16.16	33.3
vi.....	35	42.8	25.7	15.1	31.4

As in the case of the preceding species, we may here note some

<sup>1</sup> The numbers in brackets are the percentage results.

<sup>2</sup> Greatest length measured.

<sup>3</sup> Gray's type specimen has lost the abactinal plates; but two specimens collected by Capt. St. John in the Korean seas are perfect.



considerable variation in the height of the specimens; the actinostome does not diminish so much in size during growth as it does in *T. toreumaticus* or *T. hardwickii*.

## II. MICROCYPHUS.

The specimens of this genus alter in appearance very greatly during growth, as may be gathered from the fact that Prof. A. Agassiz formed a new genus *Anthechinus* (*roseus* sp.) for some rather young examples of *M. maculatus*; and matters are, unfortunately, a little complicated by the fact that the young of *M. zigzag* (as determined by Prof. Alex. Agassiz) have externally a most remarkable resemblance to the young of *M. maculatus* (*Anthechinus roseus*).

The information which can be given regarding these two species is somewhat meagre; the most interesting point is, perhaps, the slight extent to which the actinostome of *M. zigzag* diminishes in proportional size during growth.

### 1. MICROCYPHUS MACULATUS.

	Absolute diameter in millims.	Percentage value of			
		Height.	Abactinal area.	Anal area.	Actino-stome.
i.....	23	73·8	26	...	44·7
ii.....	27	70·3	26·3	11·1	40·7
iii.....	37	62·1	21·6	...	36·5
iv.....	45	62·6	20	...	33·3

### 2. M. ZIGZAG.

	Absolute diameter in millims.	Percentage value of			
		Height.	Abactinal area.	Anal area.	Actino-stome.
i.....	8	...	...	...	31·2
ii.....	8·2	...	...	...	32·9
iii.....	15·5	77·4	32·2	12·9	25·8
iv.....	23	84·7	23·9	8·7	30·4
v.....	25	84	24	...	28·8

## III. SALMACIS.

Of all the genera of the Temnopleuridæ, this is perhaps the most difficult; the determination of its species has more than once engaged my attention, and has been more than once put aside in despair. Now, however, I have the advantage of having at hand the preliminary set of specimens collected by the officers of H.M.S. 'Challenger' and named by no less an authority than Prof. Alex. Agassiz. Some of these are exceedingly interesting as being very young specimens. Now, too, I have at hand the three interesting

forms which were collected by Captain H. C. St. John (H.M.S. 'Sylvia'), and which have been so well described by Mr. W. Percy Sladen<sup>1</sup> as the young of *S. sulcata*.

The number of specimens of this genus, however, is by no means large; and though thus increased it is not yet sufficient to enable us to answer all the problems which the genus presents to us. On the other hand, the question of whether or not one should put out such results as have been attained to, seems to me to be more readily answered in the affirmative in the case of groups, specimens of which are notoriously infrequent. In other words, where specimens or series are scarce, bibliographical aid may be advantageously increased, and that the more when, as here, very little of that kind of work is already available. This section of the present communication will also differ in character from that of the greater part of the rest, by entering into a fuller account of the constituent species.

The reader shall first be put in possession of the number and characters of the more important specimens now in the British Museum:—

1. *SALMACIS BICOLOR*.

*a.* Two tests, without spines or abactinal plates, buccal membrane, or dentary apparatus. Coll. Inwood. *Hab.* — ?

*b.* A fine specimen in spirit, perfect. Coll. H.M.S. 'Challenger.' Zamboanga.

2. *S. DUSSUMIERI*.

*a.* Four dried denuded specimens. Coll. Inwood. *Hab.* — ?  
(The *Toreumatica concava* of Gray.)

*b.* One injured denuded test. No history.

3. *S. GLOBATOR*, *vide infra*.

4. *S. RARISPINA*.

*a.* A denuded specimen with abactinal and anal area complete. Bondy Head. Earl of Derby.

*b.* A similar specimen. "Portugal." Purchased of Cuming.

*c.* Small, denuded. H.M.S. 'Challenger,' Station 183.

*d.* Two small, with a few spines. H.M.S. 'Challenger,' Station 186.

*e.* A larger specimen with some spines. H.M.S. 'Challenger,' Station 186.

*f.* A small dry test. Coll. Belcher. East Indies.

*g.* A small dry test with a few spines. Mindanao. (I place this specimen here with considerable hesitation.)

5. *S. SULCATA*.

*a.* Three small specimens, with some spines. Coll. St. John. 34° 38' N, 126° 24' E.

*b.* Two, with spines, in spirit. H.M.S. 'Challenger,' Island of Mactan, Cebu, Philippines.

<sup>1</sup> J. L. S., Zool., xiv. p. 439.

## 1. SALMACIS BICOLOR, Ag.

*Salmacis bicolor*, Agassiz and Desor, Cat. Rais., Ann. Sc. Nat. (3) vi. p. 359.

This, when completely covered with spines, is a most beautiful form: above the ambitus it is covered with short sharp purplish red spines, banded with greenish-yellow; at and below the ambitus the spines are much stronger and longer and are more closely packed, while the colours are reversed in relation, and they may be said to be of a greenish-yellow, banded with a purplish red; the base, however, is always coloured red. Around the actinostome the spines are still stronger and are completely flattened. The test is well rounded and by no means conical. The actinal and abactinal areas are of a moderate size; a bare median space can, above the ambitus, be distinctly made out in both the ambulacral and interambulacral areas.

In the denuded test the primary tubercles on the interambulacral plates are, above the ambitus, best developed on the half of the plate nearest the ambulacral pores; about the middle of the side of the test there are two well developed primary tubercles, and internally to these there are two smaller ones; passing upwards these latter gradually diminish in size till they disappear; and within a few plates of the abactinal area the same happens with the outermost row of tubercles; so that the uppermost of the coronal plates have only one well-developed primary tubercle each. At the ambitus there are five well-developed primary tubercles on each interambulacral plate; and these tubercles, forming a close mail on the actinal face of the test, gradually disappear as they pass towards the actinostome. There is a fairly well-marked series of miliary tubercles running along the upper edge of each coronal plate; but these become much more irregular on the uppermost plates. A dark-coloured band runs along the sutures of the plates above the ambitus.

On the ambulacral plates the primary tubercles form a single row, which is placed quite at the outer edge and extends regularly from pole to pole, gradually decreasing in size as they pass in either direction from the region of the ambitus; it is only quite close to the ambitus that a second row of primary tubercles is at all well-developed. The actinostome is of a moderate size, not sunken; its decagonal form is well marked, the ridges connecting the auricles are low; the pore-areas are wide, four pores, or two pairs, being placed in an almost horizontal line. The sutural pores appear to become indistinct with age.

	Absolute diameter in millims.	Percentage value of				Poriferous zone.
		Height.	Abactinal area.	Anal area.	Actinostome.	
i.....	44	59	18	...	20.5	2
ii.....	52	59.6	17.39	...	27.8	2.6
iii.....	75	66.6	16	8	24	3

The last specimen had spines of three lengths—8, 13, and 9·5 millims. long being averages.

This species has been very well figured by Desor (Synopsis des Echin. fossiles, pl. xvii. figs. 11–12).

## 2. SALMACIS DUSSUMIERI, Ag.

*S. dussumieri*, Agassiz & Desor, Cat. Rais., Ann. Sci. Nat. (3) vi. p. 359.

*Toreumatia concava*, Gray, P. Z. S. 1855, p. 39.

This species is so well marked that it is unnecessary to give as full an account of it as of the preceding species. It is certainly not the most nearly allied of the genus to *Temnopleurus toreumaticus*; and Prof. Alex. Agassiz seems to be completely justified in associating the *Toreumatia concava* of Gray with the representatives of the genus *Salmacis*<sup>1</sup>.

Very few spines remain on the five tests in the Museum collection; what there are are quite close to the actinostome, and are of a milky-white colour; some must have been of some strength, and others more delicate; the longest I could measure was 4 millims. long (from a test 32 millims. in diameter). The ocular plates may be shut out from the anal area; the anal orifice seems to be placed at the edge, and not in the centre, of the anal area; when there are vertical rows of tubercles on each half of the ambulacral plates, the tubercles do not form transverse rows, but are set alternately. The auricles are connected by ridges about half their height.

	Absolute diameter in millims.	Percentage value of			
		Height.	Abactinal area.	Anal area.	Actinostome.
i.....	37	30	21·6	12·1	24·3
ii.....	32	29·7	18·7	12·5	26·5

## 3. SALMACIS RARISPINA, Ag.

*Salmacis rarispina*, Agassiz & Desor, Catal. Rais., Ann. Sc. Nat. (3) vi. p. 359.

This is, on the whole, one of the most easily recognizable of the species of this difficult genus; but its distribution appears to be somewhat unusual if the locality of "Portugal," attached to one of the specimens in the collection, be correct; it will be safer, however, to wait for further examples of the occurrence of this form off the Portuguese coast.

It is at once distinguished not only by the flesh-coloured lozenge-shaped patterns on its yellowish-green upper surface, but by its

<sup>1</sup> *T. concava* was not the type of Gray's genus *Toreumatia*; nor is there any example of the species in coll. B. M. which is known to have come from Hong-kong. None of the Museum specimens has any locality attached; but Gray (*loc. cit.*) gives "*Hab. China.*"

enormous abactinal system, its comparatively large anal area, and its small rounded actinostome with a thin complete edge.

The following measurements of the specimens from Bondy Head and "Portugal" may be compared with those given by much younger and by intermediate specimens.

	Absolute diameter in millims.	Percentage value of			
		Height.	Abactinal area.	Anal area.	Actinostome.
Portugal .....	74	66	19	9.86	22.19
Bondy Head...	64	60	21.09	10.1	21.9
Station 188 ...	22.5	53.3	22.2	11.1	31.6
Station 186 a..	14	57.14	21.4	...	32.1
Station 186 β..	9	...	...	...	33.3

It is obvious from the above figures that the most marked changes occur in the actinostome, which, almost large in the young, becomes so small in the well grown forms; and it is interesting to compare the change with what obtains in *Temnopleurus*. *T. toreumaticus* has the actinostome even proportionally larger when young; but its adult specimens (50 millims. in diameter) present a percentage value for their actinostome of as much as 26, the relation between the young *Salmacis* and the adult *Temnopleurus* being, even in the character of the actinostome, not obscurely indicated.

The following points may also be noted in the young specimens:—The lozenge-shaped patches are not yet apparent; the sutural pores are much more distinctly marked; there is only one distinct series of primary tubercles in each set of coronal plates above the ambitus; below the ambitus there are indications of a second and, still more faintly, of a third series in the interambulacral areæ; the anal covering-plates are for the most part large, and consequently few in number; the most striking in the specimen, 22.5 millims. in diameter, are five peripherally placed plates, which are separated from one another by small triangular plates, one for each.

The test is much thinner in the fully grown than in the young specimens; the bare median spaces are more considerable in this than in any other species of the genus; and the tubercles are proportionally smaller; the actinal surface becomes a little swollen, so that the actinostome becomes somewhat depressed; the ridges connecting the not strongly developed auricles are low; the madreporic is hardly larger than the other genital plates; the anal opening is at or close to the centre of the anal area.

#### 4. SALMACIS SULCATA, Ag.

*Salmacis sulcata*, Agassiz & Desor, Catal. Rais., Ann. Sc. Nat. (3) vi. p. 359.

Test rounded, or somewhat conical, closely covered with spines of a general green coloration, but becoming almost white towards

their tips; the upper ones are banded with brown, those near the ambitus with purplish brown; those around the actinostome are flattened, and the bands become distinctly purple, while the green is evanescent.

The denuded test, though not unlike that of *S. bicolor*, is distinguished from it by its depressed actinostome, the greater height of the ridges connecting the auricles, the somewhat narrower ambulacral pore-areas, and the more distinct sutural pores. The changes during growth in the proportional size of the actinostome are somewhat striking; and I regret that it is only in the lately acquired specimens that the abactinal and anal areas are complete, so that it is impossible to trace the changes which occur in this region. Prof. Agassiz's specimens seem to be in a somewhat similar plight; for he is only able to give the measurements of the abactinal and anal systems of one of his specimens; the percentage value of the abactinal area in the specimen measured by him is 18.5. The great changes in the proportions of the actinostome point to the necessity of carefully examining a series of forms before using the size of this orifice as a specific character.

	Absolute diameter in millims.	Percentage value of			
		Height.	Abactinal area.	Anal area.	Actinostome.
i.....	14	59.2	22.1	12.5	42.8
ii.....	17	64.9	23.5	11.7	41.1
iii.....	45	51.1	...	...	25.4
iv.....	59	45.7	...	...	26.6

It may be of interest to point out that there is in the Museum collection a specimen which, resembling very closely the *S. conica* of von Martens, appears to bear out the view of Prof. Alex. Agassiz that *S. conica* is synonymous with *S. sulcata*. Von Martens's specimen measured 72 millims. in diameter and 55 millims. in height, thus giving the latter a percentage value of 76.3; the specimen now under description had a diameter of 77 millims., and the percentage value of the height, abactinal and actinal areas, were respectively 65, 15.5, and 22.

Some link is yet wanting to connect with these conical specimens of *S. sulcata* a specimen from an unknown locality, the height of which is 91 per cent. of the diameter, and which hardly conforms, in some other points, to the ordinary specimens of this species.

##### 5. SALMACIS GLOBATOR.

Two distinct species appear to have been described under this head—one by Agassiz & Desor, in the Catal. Raisonné (Ann. Sc. Nat. (3) vi. p. 359), the other by Prof. Alex. Agassiz, in the 'Revision of the Echini' (iii. p. 473). One point will suffice to

show that the same specimens can hardly have been described by both these writers—the only authors who have given us original accounts. The first description of the species contains the words “Deux rangées de tubercles sur les aires ambulacraires et sur les aires interambulacraires;” in the second we find:—“In specimens measuring 60 millims. there are as many as six vertical rows [of primary tubercles] on each side of the median line at the ambitus in the interambulacral, and three in the ambulacral space.” This would give twelve interambulacral tubercles, and might therefore lead us to think that “deux” was a misprint for “douze,” were it not that there are still only six ambulacral tubercles.

Any zoologist who will take the trouble to refer to Mr. Alex. Agassiz's description, will see that it is impossible to found any definite opinion on the subject from the data there given; nor can I reconcile with one another the two following statements concerning the species:—(i.) “There are no sutural furrows on the actinal side;” and (ii.) “The sutural furrows of lighter colour and yellowish on the actinal surface.”

There are in the Museum collection specimens which can be made to agree with the greater part of Mr. Alex. Agassiz's description; and the national collection is credited by him with specimens from the east and west coasts of Australia. I have searched in vain for specimens of *Salmacis* from a locality so described; but there is a specimen from the east coast of Australia collected by Stutchbury (?), which is either a representative of L. Agassiz's *S. globator*, or is a member of an undescribed species; for this specimen has above the ambitus only one row of primary tubercles in each half of the interambulacral areæ.

To attempt to resolve the difficulties which beset the determination of this species, I addressed myself to the distinguished naturalist who has the care of the Echinodermata in the Muséum d'Histoire Naturelle at Paris, thinking that, as the type of Agassiz and Desor's species was in the “Collection Deshayes,” it was possible it might be now under his care. Prof. Edmond Perrier responded to my appeal with a courteous rapidity; but, unfortunately, he could only say that the species is not in the Museum of the Jardin des Plantes. With great kindness he promised to pay a visit to the Ecole des Mines, as he fancied the species was there; as, however, I have not again heard from M. Perrier, I fear that his search has not been rewarded.

Whatever course be now adopted, it is obvious that there is one which would add to the present existing confusion; that would be to propose a new specific name. That course I will not adopt; and while it is difficult to know what to do to escape from the difficulty, I think the safest course at present is to give a short description of the two forms, and to supply accurate figures of them both. Notwithstanding the large number of plates, which form a not inconsiderable portion of the Revision of the Echini, the only parts that are figured of the rare and little known *S. globator* is a plate from the ambulacral tube.

( $\alpha$ ) The specimens with a number of primary tubercles in a transverse row (Plate XLI. figs. 1, 7).

The test is pretty thick; the poriferous zones are narrow; the actinostome is of moderate size, and sunken; the actinal cuts are very shallow and wide. The test is grey or light brown; the poriferous zones and the median space of the interambulacral area may be of a yellowish hue. At the ambitus there are, in the interambulacral area, six or seven tubercles on either side of the middle line. In the ambulacral area there are three tubercles on each plate; all these tubercles are of very much the same size; they decrease in number as they pass to the actinal and abactinal poles: but they are more closely packed on the actinal surface; for there there is no bare median space; there, too, the plates are not quite so wide, and they are not separated from one another by any sutural furrows. The upper portion of the plate is occupied by a fairly regular row of miliaries. The auricles are exceedingly strong and high, as are, too, the connecting ridges; the foramen is not as high as the ridge, and is triangular. I can give no information regarding the abactinal or anal areas.

Two specimens measured in diameter 67 millims.; one was 30 and the other 33 millims. high; the actinostome of either measured 18 millims. across; the smallest of the three specimens was 58 millims. in diameter, 40 in height, and had the actinostome 17 millims. broad.

None of the specimens has any known history or locality.

( $\beta$ ) Specimens with one vertical row of primary tubercles above the ambitus (Plate XLI. figs. 2, 3, 8).

Test not quite so thick as in ( $\alpha$ ); the actinostome somewhat smaller, and the cuts deeper; it is not quite so sunken; the poriferous zone wider; the pores frequently have on their outer edge tubercles, and do not, therefore, occupy a completely marginal position on the ambulacral plates.

At the ambitus there is only one large primary tubercle on either interambulacral plate; this is rather nearer the outer than the inner edge of the plate; and on either side of it there are two or three distinct secondaries. On the actinal surface there are four, three, or two tubercles, large, and of much the same size, on every interambulacral plate; below the ambitus in the ambulacral area there are two rows of primary tubercles; and from the ambitus to the actinostome two rows, gradually decreasing in size, are intercalated between these; above the ambitus the outer rows, which are continued to the abactinal pole, decrease at first rapidly in size. The other rows are likewise continued some way up the side of the test; but the tubercles diminish so much in size that they are with difficulty to be distinguished from the miliaries.

The anus is large, the genital rings narrow, the madreporite not much larger than the other genital plates; the ocular plates are excluded from the anal area. The auricles are very well developed, but the connecting ridges are rather low; the foramen is a little larger than in the form just described, is triangular, and is just



higher than the connecting ridge. The sutural furrows are barely indicated; there are pores, not pits, in the middle line.

Australia (coll. J. B. Jukes). E. coast Australia (Stutchbury?).

	Absolute diameter in millims.	Percentage value of			
		Height.	Abactinal area.	Anal area.	Actinostome.
i.....	72	61.1	16.6	9	25
ii.....	75	61.3	...	...	25.3
iii.....	102	64.7	...	...	21.08

#### IV. MESPILIA.

##### 1. MESPILIA GLOBULUS.

I have not the time to notice in detail the bibliography of another writer; but there are some omissa of references and misprints in the bibliography and synonymy of this genus, as given in the 'Revision of the Echini,' that, to save future students a labour similar to that which has been imposed on myself, I will for a moment turn aside to point out.

On p. 143 *Mespilia* is ascribed to Agass., on p. 193 to Des. (*i. e.* Desor); a reference to the Catal. Raisonné (p. 357<sup>1</sup>) shows that the latter authority is the correct one<sup>2</sup>. In the reference to Klein the page (p. 16) is omitted; in that to Leske the page is again omitted (it is p. 152): pl. x. is a misprint for pl. xi., in the case of both these authorities. It is impossible to discover whether the MS. name of *versicolor*, first used by Agassiz in his 'Observations,' &c. published in the 2<sup>d</sup>e Monograph. des Echinodermes (1841), p. 7<sup>3</sup>, is to be ascribed to Valenciennes, who did name a number of Echinids, or to Valentin, who was a valuable collaborateur of Prof. Louis Agassiz. With such confusion, due to the adoption, without definition, of a MS. name, it is surprising that Mr. Agassiz should complete his synonymy with giving publication to a manuscript name by Michelin.

It is not the purpose of the present communication to give fresh definitions of all the genera or species, or there would be much to say of this interesting and beautiful form. The accessions to the Museum since the time when the geographical range of the species was stated in the 'Revision of the Echini' have been from three sources—(1) the Rev. S. J. Whitmee, (2) the collection of H.M.S. 'Challenger,' and (3) the collection of the late Dr. Bleeker,—these being (1) Samoa and Savaii, (2) Zamboanga, and (3) Celebes and New Guinea respectively; but they do nothing to increase the extent of its area. A specimen from the island of Masbate has long been in the collection of the Museum. An examination of the

<sup>1</sup> Ann. de Sc. Nat. (3) 1846, vi.

<sup>2</sup> Cf. also Desor, 'Réponse à M. Agassiz' (Syn. d. Echin. foss. p. xv).

<sup>3</sup> This is ordinarily quoted by Prof. A. Agassiz as Int. Mon. Scut.; on this occasion, however, he prefers to refer to it as "Monog. Scut."

appended Table will show very clearly that the abactinal, anal, and actinal areas rather vary in individuals than grow smaller with age; in this point the species resembles rather *Amblypneustes* than *Temnopleurus*. The specimens vary considerably in colour, being in some cases banded with bright red and altogether devoid of a greenish hue; in another the bands are not purplish, but of a darker green at the base; in others the base of the spine is not light green, but is of a dark straw-colour. The variations in height are shown by the measurements to extend within wide limits.

	Absolute diameter in millims.	Percentage values of			
		Height.	Abactinal area.	Anal area.	Actino-stome.
i.....	16.5	78.7	21.2	10.9	33.3
ii.....	23.5	72.3	19.1	8.5	34
iii.....	24	84.5	18.7	8.75	33.7
iv.....	31	67.7	19.3	8.3	32.2
v.....	36	88.8	16.6	8.6	27.7
vi.....	40	85	...	...	25
vii.....	42.5	66.1	18.8	9.8	34.1

#### V. AMBLYPNEUSTES.

It will still, I fear, be some time before we shall be able completely to "unravel this difficult genus;" and so far as the difference in size of the genital pores is concerned, a new difficulty is almost as much introduced as old difficulties explained.

I have seen no specimen of *A. pentagonus*, A. Ag. If *Codechinus*, Desor, is really synonymous with *Amblypneustes*, the genus will differ from all its allies by passing back as far as the Lower Cretaceous formations; for even *Pleurechinus* and *Temnechinus* are, so far as we yet know, Tertiary forms<sup>1</sup>. But *Codechinus* is defined by Desor as having no angular pores, and it is possible that the two genera are distinct.

#### 1. AMBLYPNEUSTES OVUM.

	Absolute diameter in millims.	Percentage value of				Poriferous zone.
		Height.	Abactinal area.	Anal area.	Actino-stome.	
i.(?)...	15	83.3	22	.....	43.3	1.5
ii.(?)...	21	88	20.3	10	33.3	
iii. ....	35	80.5	21.4	11.4	28.5	
iv. ....	40	102.5	20	9.7	28.7 <sup>2</sup>	
v. ....	42	100	27	8.3	26.1	
vi. ....	47	100	15	7.5	21.3	2.0
vii. ....	58	97.4	16	8	21.5	

<sup>1</sup> Handbuch der Paläontologie (Zittel), i. 3, pp. 507-509, and Synop. des Échinides foss. p. 111.

<sup>2</sup> This is almost a pentagonal variety.

It is with some hesitation that I include in this rather unsatisfactory series the first and second examples, the great difficulty in the way of associating them with the larger specimens being the much greater proportional size of the tubercles on the test; other forms, however, present just the same relation, and the difference in the proportional size of the tubercles in examples iii. and vii. is itself sufficiently striking.

Two of the specimens in the Museum collection are stated to have been collected at the Cape of Good Hope. The test is sometimes reddish or purplish in colour, and it is not always that all the ocular plates are shut off from the anal area.

## 2. AMBLYPNEUSTES GRISEUS. (Plate XLI. figs. 4, 5, 6.)

The Table just following shows that there is a considerable variation in the proportions of the species; it will, however, be pointed out that these differences are associated with others which led to the possibility of their being different sex-forms. In any case, it is, without a large series of specimens, impossible to see fully how these differences run, and I am convinced that no good would be gained by attempting to affix distinct names to the two forms. Younger specimens than have yet come to hand will resolve some of the difficulties, and an examination of living specimens will do even more.

	Absolute diameter of test in millims.	Percentage value of				Poriferous zone.
		Height.	Abactinal area.	Anal area.	Actinostome.	
i.....	14	...	21.4	...	35.7	1.2
ii.....	28	89.2	22.1	11	31.1	1.9
iii.....	28	91.4	16	7.8	23.6	2
iv.....	28.5	...	21.9	...	35	2
v.....	33	...	...	...	33.3	2
vi.....	35	92.9	17.1	8.5	22.8	2.2
vii.....	40	90	22.5	10.2	27.5	2.3
viii.....	41.5	91.5	14.4	7.2	22.1	3.1
ix.....	42	75	20.2	10.6	29	2.6
x.....	45	86.6	14.4	6.6	20	3.5
xi.....	56	85.7	16	7.5	21.4	4.1

It does not require much observation to see that these measurements point to two distinct series of proportions among forms which by the other characters of their test appear to be most intimately allied: one series, represented by xi., x., viii., and vi., have a small actinostome, a small abactinal area, and a rather wide poriferous zone; the other, as seen in ix., vii., iv., has the actinal and abactinal areas very much larger and the poriferous zone rather narrower. With these characters two others, that cannot be represented in the Table, are associated; those with the small actinostome have much larger genital pores, and the madreporic plate is much more prominent. I hesitate, however, to separate them, for

in other points they are almost exactly alike. Is it possible that they are different sex-forms of the same species?

### 3. AMBLYPNEUSTES FORMOSUS.

Capt. Hutton states (Trans. New-Zealand Inst. ix. p. 352) that his *E. elevatus* (Catal. N.-Z. Echinodermata, p. 11) is synonymous with this species.

There are, as is well known, a number of specimens of this species to which it is easy enough to allot their place, and the only difficulties which arise are those which are consequent on the close affinity of the species *A. pallidus*.

What is of especial interest to note is that here, just as in the forms united under the head of *A. griseus*, there are two very distinct sizes of the genital pores; the distinction is obvious enough when a few specimens are carefully observed; but there is no great difference in the moderately-sized madreporic plate, nor can I arrive at any definite correlation of differences in proportion, similar to those already noticed in *A. griseus*. It is to be hoped that naturalists, who are enabled to get their specimens fresh, will be able to discover with what difference, if any, in the characters of the genital organs this difference is connected. I have been anxious to find some means of expressing this difference:—first, for the purpose of affording a standard to those who are also working at this subject; and, secondly, for the purpose of presenting the difference in relations distinctly to the minds of those who take a less special interest in the matter. By the kindness of a colleague I was provided with four entomological pins of different sizes; the most delicate was almost exactly half the diameter of the strongest; their numbers, for which neither he nor I are responsible, are respectively 2, 17, 14, 16. No. 2 is the most delicate, and no. 14 is thicker than no. 17; and no. 16 is the thickest, and is rather more delicate than an ordinary toilet-pin.

i. A specimen measuring 34.5 millims. in diameter just allowed the insertion of pin 16 into one of the genital pores.

ii. A specimen measuring 35.1 millims. in diameter was injured by pin 17.

iii. A specimen measuring 28 millims. would only admit the tip of pin 2.

iv. A specimen measuring 20.5 millims. easily admitted pin 17, and just refused 14.

v. A specimen measuring 21 millims. only admitted just the tip of pin 2.

Two series are therefore quite evident.

Prof. A. Agassiz has directed attention by his figures to the depressed and oviform varieties of the test; the succeeding Table illustrates this well enough, as it shows that the height may be only 84.1 or as much as 102 per cent. of the diameter of the test; the three other specimens present, however, a very striking similarity in proportion.

	Absolute diameter in millims.	Percentage value of				Poriferous zone.
		Height.	Abactinal area.	Anal area.	Actinostome.	
i.....	14	92.8	21.4	10	35.7	.9
ii.....	21.5	84.1	18.6	9.3	30.2	1.1
iii.....	28	92.8	17.8	...	28	
iv.....	34	91.1	17.6	8.8	24	
v.....	36	102	16.9	10	27.7	.2

The diminution in the proportional size of the abactinal or actinal areas is very fairly shown by this Table. The auricular foramen is sometimes almost a complete square; the auricles vary a little in height, but the connecting ridges are always low. The spines may be all white, or they may be of a light brick-red.

#### 4. AMBLYPNEUSTES PALLIDUS.

Just as it is possible to distinguish a number of forms which, by their exquisite pattern, are seen to be specimens of *A. formosus*, so, too, it is possible to separate off a series of forms in which the pattern on the test is only visible on very close examination; these can at any rate be ranged under the head of *A. pallidus*. When the succeeding Table of measurements is compared with that of *A. formosus*, it will not be hard to formulate certain differences between them: the fifth specimen is interesting as presenting the oviform arrangement in having the height greater than the diameter; and here, as in *A. formosus*, we find an example of how greatly the species of this genus may vary in form. We find, moreover, that in *A. pallidus* (saving always specimen v.) the abactinal area increases in size with an increase in diameter, whereas in *A. formosus* it diminishes very markedly; so, again (again excepting v.), we find the actinostome to be not much larger or much smaller proportionately in specimens of different sizes, while in *A. formosus* the actinostome diminishes very much in size at a comparatively early stage, and then varies within considerable limits. These, however, though real characters, are not easily grasped, and it is difficult to say what points of distinction can be at once appealed to as readily accessible to the zoologist.

Prof. Alex. Agassiz states that the only points of difference which he can find between them are:—

(1) The slight development in *A. pallidus* of the coloration and pattern of sculpture so distinctive of *A. formosus*.

(2) The presence of secondaries and small miliaries in the narrow poriferous zone of *A. pallidus*.

(3) The less numerous median sutural pores of the same form.

(4) The greater uniformity [in size] and more irregular arrangement of the tubercles of *A. pallidus*<sup>1</sup>.

<sup>1</sup> I base this view on the supposition that the word "separate," in line 9 of p. 482, is a *lapsus plume* for "unite."

For the purpose of this investigation it is unnecessary to enter into a detailed comparison of the two admirable sets of figures of *A. formosus* and *A. pallidus* given by Valenciennes in the plates to the 'Voyage de la 'Vénus,'<sup>1</sup> for there is no question as to the existence of two very different forms; the difficulty lies rather in the presence of intermediate forms. Thus both Valenciennes and Agassiz would seem to look upon the rarer sutural pores of *A. pallidus* as an important distinction; but specimens, and those always small, will be found in which these pores are just as numerous as in *A. formosus*: and, on the other hand, there may be found examples of *A. formosus* in which the sutural pores are just as rare as in the typical *A. pallidus*. Again, although they are rare, secondaries and miliaries are to be found in the poriferous zones of *A. formosus*, and may be rare enough in *A. pallidus*.

I am, on the whole, inclined to keep these two species distinct; the differences in proportion are differences which, if, on further investigation, the results here attained to shall be confirmed, should of themselves be regarded as at least of equal value with such eminently variable characters as the number of pores or the distribution of miliary tubercles. But, while I thus exhibit a somewhat stronger inclination than Prof. Agassiz to keep the species separate, I shall, no less than he, look out anxiously for those intermediate forms, of which he speaks with such confidence.

	Absolute diameter in millims.	Percentage value of				Poriferous zone.
		Height.	Abactinal area.	Anal area.	Actinostome.	
i.....	17	84.7	15.2	...	32.3	1.1
ii.....	19.2	87.5	15.6	...	31.8	1.2
iii.....	31	91.9	19.3	10.3	30.6	1.9
iv.....	33.5	92.8	19.4	9.8	32.8	2
v.....	41	103	14.6	...	22.6	2

## VI. HOLOPNEUSTES.

### HOLOPNEUSTES POROSISSIMUS.

The single specimen by which this genus or subgenus is represented in the Museum belongs, I fancy, to this species, and not to *H. purpurascens*, as stated by Prof. Agassiz. I give the more important measurements, which throw into relief the rather small size of the actinal and abactinal areas, and the extraordinary development of the poriferous zone.

Diameter. millims.	Percentage value of				Poriferous zone.
	Height.	Abactinal area.	Anal area.	Actinostome.	
52	78.8	15.3	6.9	22.1	6.2

<sup>1</sup> Zoophytes, pl. ii.

## EXPLANATION OF PLATE XLI.

Fig. 1. Test of *Salmacis globator* (form  $\alpha$ ), p. 431; nat. size.

2. " " (form  $\beta$ ); nat. size.

3. Apical area of "*S. globator*,  $\beta$ ; somewhat magnified.

4. Apical area of *Amblypneustes griseus*, p. 436, from a specimen with large generative pores; somewhat magnified.

5, 6. *A. griseus*; the two forms, showing the difference in the width of the poriferous zone; nat. size.

7. Outline sketch of auricle of *S. globator*,  $\alpha$ .

8. " " " "  $\beta$ .

### 3. Notes on some Japanese Mammalia. By Dr. A. GÜNTHER, F.R.S., Keeper of the Zoological Department, British Museum.

[Received May 22, 1880.]

(Plate XLII.)

I have recently had the opportunity of examining two collections of Mammalia made by Messrs. H. Pryer and C. Maries in various parts of the Japanese islands. Several desiderata and the more interesting specimens were acquired for the British Museum, and on some of them I beg to offer the following remarks.

#### UROTRICHUS TALPOIDES, Temm. (Plate XLII.)

During the examination of the series of specimens in the British Museum I have met with some points which do not seem to have been hitherto noticed in the descriptions of this species.

1. The colour of dried specimens is a dark sooty brown; and the same coloration I notice in an adult female, preserved in spirits, obtained by Mr. Maries near the river Nikko, in Nippon. This specimen is adult, as shown by the fully developed condition of its generative organs. A second female (Plate XLII. fig. B), found by Mr. Pryer near Yokohama, likewise fully adult, possesses a fur of a highly iridescent colour, a bright sapphire-green being visible in whatever direction the animal is viewed. I cannot observe any other difference between this and the former specimen, except that it has the tail beset with longer and denser hairs. It would be interesting to know whether the iridescence of the hairs is apparent at certain seasons of the year only.

2. In the milk-dentition of an immature example, the skull of which, however, is 26 millims. long, I notice that each of the anterior incisors is strongly lobate on its outer margin near the base; also the second incisor shows an indication of a similar lobe, and is much less conical than its successor; the premolars and molars of the milk-as well as permanent dentition show a remarkable agreement both as regards number and form.

I have compared on this occasion with the Japanese species the North-American *Urotrichus gibbsii*, Bd., of which an adult male

specimen (Plate XLII. fig. A), preserved in spirits, was obtained by the late Mr. J. K. Lord, who described its habits in the P. Z. S. for 1864, p. 161.

As far as external characters are concerned, the American species could scarcely be generically distinguished from the Japanese form. Its snout and nostrils are similarly formed. The eye is in the same rudimentary condition, little conspicuous, and nearly hidden under the skin. The ears are wide slits, nearly longitudinal with regard to the axis of the body, and placed so far back on the side of the head as to be opposite to the base of the fore legs. The fore feet (fig. *a*) are rather broader than in *U. talpoides* (fig. *b*), whilst the tarsal tubercles on the sole of the hind feet (fig. *a'*) are much less developed than in that species (fig. *b'*). The fur is lustrous, but less so than in the female from Yokohama described above; and the hairs on the tail are so sparse and short as to leave the verticelli uncovered, almost as in a rat's tail. The specimen has an extremely thin but prominent penis, projecting 5 millims. beyond the skin.

With regard to its dentition (figs. *u*, *l*) *U. gibbsii* differs so much from the Japanese species, that, in my opinion, it should be placed in a distinct genus, for which the name *Neurotrichus* may be used.

Mr. Mivart in the 'Journal of Anatomy and Physiology,' ii. 1868, arranges the dental formula for the Japanese *Urotrichus* thus:—

$$I. \frac{2-2}{1-1}. \quad C. \frac{1-1}{1-1}. \quad Pm. \frac{4-4}{3-3}. \quad M. \frac{3-3}{3-3} = \frac{20}{16} = 36.$$

In *Neurotrichus* the formula would be

$$I. \frac{2-2}{1-1}. \quad C. \frac{1-1}{1-1}. \quad Pm. \frac{3-3}{4-4}. \quad M. \frac{3-3}{3-3} = \frac{18}{18} = 36.$$

Dr. Baird (Mamm. N. Am. p. 77) has already mentioned the curious scalpriform modification of the upper and lower front incisors, which remind us of those of *Scalops* and *Condylura*; the upper are much broader than the lower, and inserted in a vertical position, whilst the lower are subhorizontal.

#### TALPA MIZURA, n. sp.

Japan is inhabited by a second species of Mole beside *Talpa wogura*. In a collection made by Mr. H. Pryer in the neighbourhood of Yokohama, there is, beside specimens of the common species, the dried skin of a Mole distinguished by the uniform slate-colour of its fur, which is also less dense and elastic than in *Talpa wogura*. But the most obvious distinctive character is its much longer tail: the total length of the specimen is 48 lines, the tail measuring 10 lines, or a little more than one fifth of the length of the body. In a specimen of *Talpa wogura* of similar size, namely 46 lines, the tail is only 6 lines long, or nearly one eighth of the length of the body. In other respects I do not find any difference from *Talpa wogura*, and unfortunately the skin is in too bad a condition to allow of the extraction of the skull.

#### URSUS ARCTOS, Linn.

Mr. Maries obtained from Yeterop, the largest of the Kurile



Islands, an adult Bear, the fur of which struck him as particularly light coloured, but of which the skull only has been preserved. It possesses all the dental characteristics of *Ursus arctos*, by which this species is distinguished from *Ursus horribilis*. The last upper molar is conspicuously contracted behind, with a distinct convex outer margin; and the smaller accessory tubercles of all the molars, which are not developed in *U. horribilis*, are in our specimen even more numerous than in typical examples of *U. arctos*.

In the series of skulls in the British Museum of *Ursus arctos*, as well as of *U. horribilis*, the mastoid process is developed in a very different degree. As regards certain individuals, this is evidently due to age; but the same difference obtains in individuals which are not merely full-grown, but of apparently the same great age. In some specimens this process is but little raised (3 or 4 lines) above the level of the bulla ossea; in others the mastoid process projects far beyond the bulla ossea, its extremity being level with the lower margin of the glenoid process, as is also the case in our specimen from Yeterop.

Although our skull approaches those described by Middendorff and Schrenk as var. *beringiana*, with regard to the relative length of the two posterior molars, it is of but moderate size, viz. 330 millims. long, and without the knowledge of its origin it could not be distinguished from some of the European varieties.

#### URSUS JAPONICUS, Schleg.

The specific distinctness of this Bear was recognized by Schlegel and Selater, the latter having figured it in Proc. Zool. Soc. 1862, pl. xxxii. As far as we are permitted to draw an inference from a single skull,

Fig. 1.      Fig. 2.



1. First upper molar of *Ursus japonicus*.
2.       "                      "              *Ursus americanus*.

we must confirm their conclusions, arrived at by a comparison of the external characters. Mr. Pryer has sent two skulls; but one only is that of an adult individual, the second being of a half-grown animal, in which the canine teeth of the permanent set are making their appearance. The skull of the adult is remarkably like that of *U. ornatus* and *U. americanus*, but smaller than any of the numerous specimens of these two species in the British Museum, scarcely measuring 9 inches from the front margin of the incisors to the occipital condyle. The first upper molar affords a marked distinctive character, being without the broad interior lobe, which is so well developed in *U. ornatus* and *U. americanus*. In the younger specimen, which has its permanent set of molar teeth, the inner lobe is indicated, but much less developed than in the continental species.

Skulls of Bears collected by Swinhoe in Formosa agree in their dentition perfectly with the true *Ursus ornatus*.

#### CALORHINUS URSINUS, L.

A young Eared Seal, 28 inches long, is in the collection of Mr. Pryer; it has no skull, but is otherwise perfect, so that there is no doubt about the correctness of the determination. It shows two characters by which this species can be readily distinguished—namely, the great width and length of the hind flapper, and, secondly, the naked surface of the upperside of the front flapper, already noticed and figured by J. A. Allen (Bull. Mus. Comp. Zool. ii. no. 1, p. 76). The hairs do not proceed beyond the carpal region, where they are arrested in a straight transverse line. It will be useful to describe here the colour of this young specimen. The longer hairs of the upper parts are brownish black with a light greyish tip, the back looking brownish black if viewed from behind forwards, and greyish if looked at in the opposite direction. The sides of the abdomen are white, the white extending upwards and forming a marked patch on each side of the sacral region. The throat and fore part of the chest are dirty whitish; the lips and chin, the lower part of the chest, a stripe along the median line of the abdomen, and the preanal region chestnut-brown. The short hairs of the flappers blackish brown. The underfur is white, slightly tinged with brown.

This species appears to be new to the fauna of Japan.

#### EXPLANATION OF PLATE XLII.

- A. *Neurotrichus gibbsii*.
- B. *Urotrichus talpoides*.
- a. Fore foot of *Neurotrichus*.
- a'. Hind foot of *Neurotrichus*.
- b. Fore foot of *Urotrichus*.
- b'. Hind foot of *Urotrichus*.
- u. Dentition of right upper jaw of *Neurotrichus*.
- l. Dentition of right lower jaw of *Neurotrichus*.

4. Description of a new Species of the Genus *Natalus* (Vespertilionidæ) from Jamaica. By G. E. DOBSON, M.A., M.B., &c.

[Received May 8, 1880.]

During my late visit to the West Indies I was fortunate enough to obtain in Jamaica the single specimen (an adult male) from which the following description is taken.

#### NATALUS MICROPUS, n. sp.

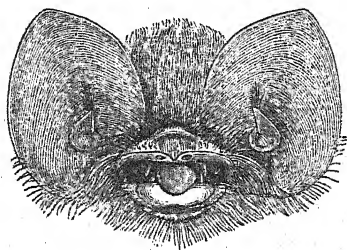
In general form resembling *N. stramineus*, but may be at once distinguished from that species by the presence of certain processes on the muzzle in front and by the very small size of the foot.

Ears and tragi like those of *N. stramineus*, but the tip of the ear-

conch is obtusely rounded off and the emargination beneath it externally is very shallow; the inner margin of the conch is also more convex, so as to project forwards as far as the extremity of the muzzle; above the nasal apertures the superior surface of the face terminates by forming a small rounded wart-like process covered on all sides, except in front, by thick-set hairs, in front it is naked with a projecting upper margin; the lower lip is reflected outwards as in *N. stramineus*, but beneath it, in front, there is, as in the species of *Chilonycteris* (Phyllostomidæ), but much less developed, a small horizontal cutaneous projection, like a second lower lip.

Wings very like those of *N. stramineus*, but the wing-membrane is attached high up, at the junction of the middle and lower thirds of the tibia; the interfemoral membrane, the tail, and the calcanea are exactly similar to the same parts in that species.

Foot extremely small, appearing scarcely half the size of that of *N. stramineus*. Fur above pale yellowish brown at the base, the



Head of *Natalus micropus*.

terminal half reddish or chestnut-brown; beneath pale yellowish brown throughout. This is the appearance of the fur in alcohol.

Upper incisors like those of *N. stramineus*, but the outer incisor on each side, instead of exceeding the inner in cross section, is equal to or even smaller than it; upper premolars as in that species, but the second premolar is still more widely separated from the third; lower incisors, premolars, and molars also quite similar.

Length, head and body, 1·5 inch; tail 1·85; head 0·65; ear 0·5; forearm 1·3; thumb 0·15; third finger—metacarpal 1·5, 1st. ph. 0·55, 2nd. ph. 0·7; fourth finger—metacarp. 1·1, 1st. ph. 0·35, 2nd. ph. 0·35; fifth finger—metacarp. 1·05, 1st. ph. 0·35, 2nd. ph. 0·35; tibia 0·65; foot 0·25.

*Hab.* Environs of Kingston, Jamaica.

*Natalus lepidus*, Gervais, is still smaller, has a differently formed tragus, and is also easily distinguished from both this species and *N. stramineus* by its dentition. (See Catal. Chiropt. Brit. Mus. 1878, p. 344.)





5. Description of a new Species of *Uromastix*. By A. W. E. O'SHAUGHNESSY, Assistant in the Natural-History Departments of the British Museum.

[Received May 18, 1880.]

(Plate XLIII.)

Among some Lizards transmitted by Dr. Kirk from Zanzibar is a very remarkable new species of the genus *Uromastix*, the type specimen of which is now in the British-Museum collection. The peculiar shape of the tail and the extreme development of the upper caudal scutes distinguish it immediately from the other species at present known, five in number, viz. *U. ornatus*, Rüpp., *spinipes*, Merr., *acanthinurus*, Bell, *fasciatus*, Ménétr., and *microlepis*, Blanf. I proceed to give the following description of this well-marked sixth species.

*UROMASTIX PRINCEPS*, sp. n. (Plate XLIII.)

Head short and broad, covered above with numerous small irregular-shaped scales, much as in *U. acanthinurus* and other species; the scales on the muzzle and the two central series between the supraorbital regions are, however, larger, and there are two large plates, a polygonal posterior and a narrow oblique anterior one, between the nasal plate and the upper anterior part of the orbital region on each side; also a series of very large infraorbital plates; the posterior upper labials but slightly enlarged or projecting downwards. Rostral broad, double the size of the mental—the rest of the scales of the head offering no points of difference from *U. acanthinurus* or *U. microlepis*, excepting that those on the temporal region are flat and smooth instead of being convex. Sides of the neck with some puckers, but without any larger pointed scales or tubercles. Neck, back, and sides covered uniformly with very small, convex, rounded or feebly pointed scales; the scales on the lower surface of the body are much larger, rhomboidal, and arranged in transverse series. Scales on the fore limb large, smooth, becoming still larger near the carpal region; no tubercular scales. On the upper and anterior part of the thigh the scales are large, smooth and regular, not spinose, a few large conical scales occurring behind and continuing at the knee and down the front of the tarsus, the inner surface of which is covered with rather large plain scales, similar to but larger than those of the foot; the other parts of the hind limb are covered with very small scales. No femoral or præanal pores in the specimen examined.

The tail is broad, flattened, and much shorter than in the other species of *Uromastix*, resembling in shape the tail of the genus of Skinks named *Silubosaurus* by Gray. Its upper surface is covered with very large spinose shields, projecting in a long curved point in the four middle shields of each of the 10 or 11 transverse rows, and forming a still larger series of more strongly curved or hooked appendages on each side of the tail; thus there are six longitudinal

series of spines on the tail, the two central ones being much smaller, while the outer ones are of extraordinary size and appearance. The inferior surface of the tail is occupied by smooth elongate scales in about 17 transverse rows, a very large, flat, unguicular plate at the commencement of each alternate row accompanying each of the large lateral hooks just described, but belonging to the lower surface of the tail.

As regards the teeth, this species exhibits the arrangement characteristic of the Lizards of this group. There are two very distinct front teeth in each jaw, then a cutting-edge, followed by a series of lateral teeth.

The general colour of the body is olive-grey, with brownish tints, and minute darker spots scattered over the back; hind limbs reddish on their outer surfaces; tail deep red; chin variegated with dark markings.

The measurements are as follows :—

	millims.
Length from tip of snout to extremity of tail . . . .	190
„ of tail . . . . .	61
„ of fore limb . . . . .	52
„ of fourth front toe . . . . .	14
„ of third front toe . . . . .	12
„ of hind limb . . . . .	67
„ of fourth hind toe . . . . .	17
„ of third hind toe . . . . .	14

## 6. On the Breeding of the Flamingo in Southern Spain. By THOMAS LITTLETON, LORD LILFORD, F.Z.S.

[Received June 1, 1880.]

Having during the summer and autumn of last year (1879) received the two nests now on the table and some four dozen eggs of the Flamingo (*Phoenicopterus antiquorum*) from Southern Spain, I think that some remarks of my own, and a few extracts from letters on the subject, may be of some interest to the Society.

The notes of Mr. Howard Saunders on the nesting of the Flamingo (in the 'Ibis' for 1871, p. 394) are probably well known to all present who take an interest in European ornithology. Mr. Saunders also exhibited some eggs of this species from Andalusia, at a meeting of this Society on June 24, 1869; but, so far as I am aware, these are the first nests of this bird which have reached this country. Exactly the same story as that recorded by Saunders about the nests, eggs, and manner of sitting of the Flamingo was related to me, and repeated at various times, by his informant, Manuel Llanos, of Coria del Rio, a village situated on the right bank of the Guadalquivir, some seven or eight miles below Seville. This individual is the possessor of a house in Coria, with a few acres of vineyard at a

short distance from that village, but subsists principally by the sale of wild fowl killed by himself and his sons in the Marisma—that is, the great alluvial plains of the Guadalquivir. These plains, roughly speaking, may be said to extend on the left bank of the main river almost from Seville to San Lucar de Barrameda, and on the right bank from La Puebla to the northern edge of the Coto de Doñana, and constitute a wild district of sand hills overgrown in some places with pines and cork-trees, and almost everywhere clothed with a dense growth of cistus, rosemary, lentiscus, brambles, myrtle, and other shrubs. This district belongs to the ducal family of Medina Sidonia, and is rented and preserved after a fashion by an association of gentlemen for shooting-purposes. I am well aware that in using the word *marisma* as applying to the whole of the open plains below Seville I am not strictly correct, for the natives apply the term principally, if not exclusively, to the uncultivated parts of the said plains; and a vast portion of them is cultivated, and produces splendid crops of wheat, barley, beans, and other cereals. It is, however, with the south-western portion of these great mud-flats (for they are really little more) that we have to deal in treating of the objects on the table; but before detailing any particulars concerning them, I may perhaps be allowed to relate a few facts touching upon my own personal acquaintance with these localities and the Flamingos.

The first time I ever met with this bird in a state of freedom was in August 1856, when ascending the Guadalquivir by steamer from San Lucar to Seville. The river was very low, and the weather very hot. An English stoker forward in the ship cried out, "Look at these here Swans"! and there, not fifty yards off, on our port bow, were eight Flamingos, apparently swimming, possibly wading, and certainly looking much like Swans to the eye of the uninitiated; however, they rose from the water, and, spreading their wings, almost took away the breath of the astonished Briton. I tried to elicit some particulars concerning the nesting of these birds from the captain and the steward of the steamer; but my conversational acquaintance with Spanish was very limited, and the heat was too great for conversation, so that my inquiries were only met by another, the usual "¿Quien sabe?" On making further inquiries in Seville, I could only learn that every one was aware of the existence of Flamingos in the Marisma, but no one seemed to know any thing of their breeding or ever having bred there. I was again at Seville in 1864, and though I was on this occasion informed that great numbers of Flamingos did occasionally breed in the Marisma, I could find no one who professed to have ever seen their nests, eggs, or young. It was not till 1869, when, in the company of my friend Colonel Howard Irby and the Manuel aforesaid, I made some bird-collecting expeditions in the neighbourhood of Seville, that I heard from the latter the particulars recorded by Mr. Howard Saunders in the 'Ibis.'

As Mr. Saunders there mentions, I remained at Seville till well on into the month of June 1869, principally in the hope that the Flamingos might remain and lay in the Marisma; but in this hope I was disappointed; and I quite agree in the opinion of Mr. Saunders,



if I quite rightly understand it, that no Flamingos had nested within thirty miles of Seville for several years previous to 1870.

In the year 1872 I again visited Seville, remaining there from the middle of February till the 1st of May, on which day we started by steamer for San Lucar de Barrameda for a fortnight's exploration of the Coto de Doñana. As soon as we left the cultivated parts of the great plain, we observed Flamingos in thousands standing in long lines in the *lucios*<sup>1</sup> of the Isla Mayor<sup>2</sup>, as well as on the left bank of the main river as we approached San Lucar. On arrival at this town, my first inquiry was if the Flamingos were nesting; and the general answer I met with was, "No, there is not water enough, and they are leaving the country in hundreds for the south every night;" you should have been here at this time the year before last (1870), when<sup>3</sup> the Isla Mayor was fairly covered with their eggs, and boat-loads of them were brought into the town and sold for a few pence per dozen, and the boys were writing on all the doors and walls with the egg-shells. In vain I inquired about the nests; no one had either seen or heard of one; and many of my informants, who had gathered baskets full of the eggs, solemnly declared that the Flamingos never *did* make nests, and left their eggs to be hatched by the heat of the sun. We remained at the shooting-lodges of the Coto de Doñana till May 16th; and almost every night large numbers of Flamingos passed over in a south-westerly direction at no very great height from the ground, with a hoarse clamour something like the music of a flock of Grey-Lag Geese. On ascending the river about the 17th of May, on our return to Seville, we saw, comparatively speaking, very few Flamingos, not more, I should say, than two hundred at the outside; but the mirage was so strong and so deceitful, that it is possible that many escaped our notice.

Two eggs were sent to me by one of the keepers of the Coto in the autumn of 1872; but he simply said that he had picked them up in the Marisma, and that they were offensively rotten, possibly eggs of 1870. I was in Seville again with my yacht in February and March 1879; but though I heard that the Flamingos were in the Isla Mayor in great numbers, we did not see many on our Bustard-shooting expeditions in the Isla Menor.

I left earnest entreaties for early information on the subject of their remaining to lay, with the following meagre results.

<sup>1</sup> "Lucio." The only translation of this substantive which I can find in the best Spanish dictionary is Common Pike, *Esox lucius*, L.; but it is used in the Marisma of the Guadalquivir as a name for the great sheets of water caused by the autumnal rains, some of which sheets are seldom *entirely* dried up, even in the fiercest summer heats. The word is in all probability derived from the verb "Lucir," to shine or glitter; *e. g.*, "Todo no es oro que reluce" ("all is not gold that glitters").

<sup>2</sup> Isla Mayor and Menor. Two large islands formed by branches of the Guadalquivir, about halfway, roughly speaking, from Seville to San Lucar de Barrameda by river.

<sup>3</sup> Mr. Howard Saunders maintains that I must be mistaken as to the date here mentioned, and that the laying of the Flamingos as related to me must have taken place in 1871, and not, as I was informed, in 1870. This is not a very material point, and I only tell the story as told to me.

From Alberto Ruiz, a young medical man of Seville, who has travelled with me as preserver of natural-history objects in Spain and various parts of the Mediterranean, I received letters from which the following extracts are translated :—

“June 19, 1879.

“I have been able to obtain a few eggs of Flamingo, which I shall have the pleasure of sending to you with some others from Manuel. On another occasion I will give you exact particulars as to site, date, &c.”

“July 11, 1879.

“The Flamingos have not bred either this year, and have only laid a few eggs; for the number of persons who harass them is so great that they do not allow them to build their nests. Manuel found the eggs which he has brought to me in the Isla Mayor, in a spot which is called La Redondilla chica, where there is a sheet of water—“lucio,” in the close neighbourhood of which he found the eggs scattered about, *not* in the water. I have 27 (eggs) which were found in the Lucio Real of the Isla Mayor on May 19, and Manuel gathered his the 21st, 22nd, and 23rd of the same month.”

“July 17, 1879.

Enclosed is a bill of lading of the cage which contains the Falcon (*F. feldegi*), and a box with a skin of Black Vulture that Manuel has prepared, and 47 eggs of Flamingo, 20 of which the old hunter aforesaid brought to me. In my previous letter I gave you the dates of the gathering of the eggs, and I must correct them with regard to the *month*, which was April, instead of May.”

“July 24, 1879.

“The evening before last I received some Flamingo eggs, and with them some new particulars, which I am going to relate in case they may be of any interest. There is a lagoon to the south of the Lucio Real in the Isla Mayor, which is called Lucio de la Sal, and close to it a new cut, or channel. Well, in those places is where the Flamingos have laid in the greatest abundance, and in which they have built an infinity of nests, which are still to be found intact; for scarcely had the San-Lucar folk received notice of the presence of the birds in the places mentioned, when they attacked them as Don Quixote did the sheep, and the poor creatures have not been able to use, for their young, the nests which perhaps they had built with great satisfaction. I have told Manuel to go for some nests in case you should wish to have some sent to you with these eggs which I now have here. The eggs were seen in the places named on April 10.”

I received the eggs above mentioned, August 20, 1879, and the two nests late in September.

From Lieut. W. Verner of the Rifle Brigade, an ardent ornithologist, and friend of mine, who accompanied Rudolf, Crown Prince of Austria, in his trip to the Marisma in May 1879, I received the following letter :—

"Winchester, May 26th.

"DEAR LORD LILFORD,—

"Yours received this afternoon. I found no nests of the Flamingo when with Rudolf; this was on May 29th, 1879. We rode many miles over the Guadalquivir marshes, and saw a flock of about 2000 birds. I found three eggs lying in the slob land about a mile from the river. The Spaniards swore that a few weeks before a man from San Lucar de Barrameda had taken about a thousand eggs. This, I am pretty sure, was a lie. From my own observations they appeared not to have begun to nest when we were there. They were in one immense flock, and flew bang out of the country after being disturbed a few times. I will look up my notes when I go to my room after mess and give any dates.

"I *heard* on pretty good authority, *i. e.* from one of the Jerez sherry-growers, that in June 1879 the Flamingos were just beginning to nest, and that some fellow had taken a lot of eggs. You see my direct evidence is very small."

From the above it would appear that the Flamingo is a more or less permanent resident in the Marisma, and that its stay therein and departure thence are regulated by the amount of rainfall and the persecution it meets with. The question that naturally rises is, whither do the immense numbers of Flamingos which frequent the Marisma in the winter retire to breed when that district is too dry for them? This question I am unable to answer, and I should be most happy to receive any information on the subject. On the disputed question of the position of the bird on the nest, I am unable to say any thing from personal experience; but I confess that I can see no reason why the Flamingo should not sit in the same way as any other bird<sup>1</sup>; and I must add that the story of the legs stretched out behind, appears to me unnecessary, improbable, uncomfortable, and, as far as I am at present aware, quite unsupported by trustworthy evidence.

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June 15, 1880.

Professor W. H. Flower, LL.D., F.R.S., President, in the Chair.

The Secretary made the following report on the additions to the Society's Menagerie during May 1880:—

The total number of registered additions to the Society's Menagerie during the month of May was 199, of which 24 were by birth, 94 by presentation, 68 by purchase, 1 received in exchange, and 12 received on deposit. The total number of departures during the same period, by death and removals, was 106.

The most noticeable additions during the month were:—

1. Two side-striped Jackals (*Canis lateralis*), from Western Africa.

<sup>1</sup> Mr. Saunders has also expressed his disbelief in the current "leg-story" in print and privately.

This little-known species was established by me in 1870<sup>1</sup> (upon a specimen living in the Society's Gardens). Mr. Van Bemmelin, of the Zoological Gardens of Rotterdam, having two pairs of it, has kindly parted with one pair in our favour.

2. A young male Lühdorf's Deer (*Cervus luehdorfi*), received May 30th.

Of the discovery of this Deer I spoke at the last meeting of the Society (see p. 420). The authorities of the Gardens at Hamburgh have kindly allowed us to acquire one of the young males born in their garden for this Society's collection.

I take this opportunity of offering some remarks upon two species previously received, which (as must be often the case with living animals) seem to have been wrongly determined.

A male Black Lemur, purchased Nov. 25th, 1878, was entered on the list of additions<sup>2</sup> as *Lemur macaco*, that being the only known species of Black Lemur. In June last we received of Mr. Badger a fine pair of the true *Lemur macaco* (male black, female = *L. leucomystax*), and our Superintendent's excellent eye immediately told him that we had here to do with two distinct species.

Fig. 1.

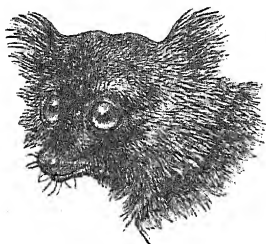
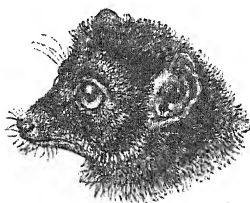
Head of *Lemur macaco*.

Fig. 2.

Head of *L. nigerrimus*.

The first arrival is a larger and more intensely black animal, with a raised crest of short upstanding hair on its head. Moreover the ear-conch is naked, and not furnished with tufts of hair as in *Lemur macaco*, from which it is certainly distinct (see woodcut). I propose to name it for the present *Lemur nigerrimus*, although it may possibly turn out to be a black variety of some known species, with the following characters:—

*LEMUR NIGERRIMUS*, sp. nov.

*Ater unicolor; pilei cristati pilis extantibus; auriculis nudis.*

*Long. tota corp. 16, caudæ 20 poll. Angl.*

In August last year we purchased of a London dealer 18 examples of a Duck from Australia, which we supposed to be *Anas punctata* (sive *castanea*) in winter costume, as they nearly resembled the figure of the female given by Mr. Gould (Birds of Australia, vol. vii. pl. xi.). They were accordingly thus entered in our

<sup>1</sup> P. Z. S. 1870, p. 279, t. xviii.

<sup>2</sup> See P. Z. S. 1878, p. 1016.

register<sup>1</sup>. Having examples of both sexes we naturally expected that the male would put on in the spring the chestnut breast and full breeding-plumage portrayed by Mr. Gould in his figure of that sex. Such, however, has not been the case; little change has occurred except the brightening of the colour; and, as far as I can make out, the birds do not belong to *A. punctata* at all, but to *A. gibberifrons*, Müller, a species closely resembling the female of *A. punctata*, which has lately been ascertained to occur in Australia<sup>2</sup>.

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Mr. Selater exhibited the skin of an Antelope received from the Gaboon, of which Mr. Wolf has prepared a coloured drawing, and remarked that it appeared to belong to the female of an undescribed species of *Tragelaphus* allied to *Tragelaphus spekii*, which he proposes to name

*TRAGELAPHUS GRATUS*, sp. nov. (Plate XLIV.)

Fur long and coarse, as in *T. spekii*, of a deep rich chestnut, paler on belly; dorsal line dark; chin, three spots on the sides of the head, throat, wide band across the neck, inside of limbs, under surface of tail, and three or four longitudinal series of spots on each side of the body (sometimes running into lines) white; feet with a dark line in front; hoofs much elongated, as in *T. spekii*.

Length of skin from the tip of nose to base of tail 6 inches, tail 6, tarsus 8, ear 4.

*Obs.* This fine Antelope is obviously nearly allied to *T. spekii*, and belongs to the same division of the genus, characterized by the long coarse hair and long tarsus and toes, which indicate aquatic and marsh-loving habits. The generic term *Hydrotragus*, Gray (Cat. Rum. 1872, p. 49), should be perhaps employed for these two species. The skin, which I now exhibit, was sent to Mr. R. W. Roulston, the Society's agent at Liverpool, by one of his correspondents at Gaboon, who asked whether such an Antelope would be required for the Menagerie. I have requested Mr. Roulston to procure a skin and horns of the male animal, and hope to receive them shortly.

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Dr. Günther exhibited a series of horns of *Cervus equinus* (S. Müller), collected by H. Brooke Low, Esq., in Sarawak. He pointed out the variation in the spread of the horns and in the direction and comparative length of the snags, and expressed his entire agreement with the view held by Blyth (Proc. Zool. Soc. 1869, p. 659), viz. that the Bornean Sambur was but a small race of the Indian *Cervus aristotelis*, at least as far as he was enabled to judge from the horns and skulls. He also exhibited for comparison a pair of horns with frontlet of an adult Sambur killed in Bengal, which, as regards size, were even inferior to those of the Bornean Deer.

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<sup>1</sup> See P. Z. S. 1879, p. 827.

<sup>2</sup> See Dr. Buller's 'Birds of New Zealand,' p. 251.

C.M.Z.S., in 1866, he proposed that *Phascologale lanigera* should be made the type of a new genus, *Antechinomys*<sup>1</sup>. The characters given by him are very brief, and, as the animal appears to be extremely rare in collections, I trust that the following detailed description of this remarkable form will be useful to any zoologist who may undertake the long-needed revision of the Marsupialia. For the opportunity of fully examining the structure of *Antechinomys*, and of comparing it with that of the allied genera *Phascologale*, *Antechinus*, and *Podabrus*, I am indebted to the kindness of Mr. Clark, Dr. Günther, and Professor Flower.

#### EXTERNAL CHARACTERS.

General form slender; head proportionally large, legs and tail greatly elongated. Head narrow, conical; muzzle produced and pointed; muffle broad, naked, with a slight median groove, but not cleft. Ears large, tapered, rounded at the tips, almost naked, except at the base and along the front edge, where they are sparsely haired; in the interior of conch near the base of the anterior margin is a curious free lobe, like the tragus of a Bat, about 0.15 inch in length, and the same in breadth. This lobe is also found in the allied genera. No perceptible pouch.

*Fore limbs* very long and slender, the forearm being about double the length of the upper arm, scantily clad with short white hairs; fore feet very small, with five digits, of which the third is the longest, the second and fourth subequal, and the first the shortest, each armed with a small but well-developed claw; soles with three large pads, covered with minute tubercles. In *Podabrus* the fore limbs are very much shorter, and the soles are similar, but have five tuberculated callosities instead of three. In *Phascologale* and *Antechinus*, on the other hand, the fore feet are comparatively broad, and the soles are naked, with elongated transversely striated pads.

*Hind limbs* nearly as slender and still more elongated, the foot longer than the forearm and nearly as long as the tibia; the muscles of the leg are only fleshy in their upper moiety, leaving the lower half slender, like that of a bird; the latter portion and the whole of the foot, except the base of the toes, rather densely clothed with small whitish hairs. Toes four in number, the first being absent, the third and fourth equal and the longest, the second and fifth subequal; claws similar to those of the fore foot; on the sole at the base of the toes is a large crescentic callosity covered with small tubercles. In all the other genera there are five toes, the first being a short nailless thumb, which is placed furthest back in *Podabrus*, but still extends almost to the base of the other digits. In that genus the hind foot is almost as slender as in *Antechinomys*, although much less elongated; the metatarsus is more or less hairy behind, and the callosity of the sole is similar, except that it is divided into three; the tarsus is almost naked behind. *Phascologale* and *Antechinus* have the hind foot very broad and short, with naked soles and transversely striated pads, similar to those of the fore feet.

<sup>1</sup> P. Z. S. 1866, p. 434.

*Tail* longer than the head and body; for more than half its length clad with very short adpressed white and brown hairs; these then gradually but rapidly increase in length, and the terminal third of the tail is covered with hairs of about a quarter of an inch in length. *Phascologale* has a similar tail; but in *Antechinus* and *Podabrus* this member is shorter than the head and body, and is clothed throughout with short adpressed hair.

*Measurements* of the specimen described (a female) in spirits:—

	inches.
Length of head and body .....	3·25
„ tail (without hairs) .....	4·60
From muzzle to eye .....	·50
„ „ to anterior margin of ear-conch ....	·95
Length of ear-conch .....	·65
Breadth of „ .....	·45
Length of forearm .....	·95
„ fore foot (without claws) .....	·26
„ longest finger.....	·10
„ lower leg .....	1·30
„ hind foot (without claws).....	1·15
„ longest hind toe (without claws) .....	·20

*Colour* of the upper parts brownish mouse-grey, darker on the occiput, paler on the face and upper part of the limbs; the hairs dusky at their bases, then yellowish white, and mostly tipped with dark brown; round the eye is an ill-defined dark brown ring, produced in front. All the lower parts, the fore limbs from the elbow, and hind limbs from the middle of the tibia pure white; the belly with a large almost naked space, not involved, and showing only traces of the mammæ. The short adpressed hairs of the basilar part of the tail are mixed white and brown, the former largely preponderating; the longer hairs towards the end rich dark reddish brown.

#### SKELETON.

The *skull* of *Antechinomys* presents no marked distinction from that of the allied genera, which agree, as Mr. Waterhouse has remarked<sup>1</sup>, in the large size of the brain-case and foramen magnum, and in the feebleness of the muscular ridges, when contrasted with *Dasyurus* and *Thylacinus*. It is, however, comparatively narrow and elongated, and the mandible is very slender, with a high coronoid process.

The *vertebræ* number:—cerv. 7, dors. 13, lumb. 7, sac. 3, caud. 25, a formula in which its allies agree, save in the tail. The lumbar vertebrae have the spinous processes better developed than in *Podabrus*, although comparatively much smaller than in *Phascologale* and *Antechinus*, while their metapophyses and transverse processes are more feeble than in any of the other genera. The caudal vertebrae are very long and slender, especially towards the extremity of the tail.

<sup>1</sup> Nat. Hist. Mamm. i. p. 403.

In the *fore limb* (fig. 1) the scapula has the usual characters of the group, the spine being boldly deflected over the postscapular fossa. The humerus, which has the usual supracondylar foramen, is almost straight, slender and simple, with hardly any muscular impressions; that of *Podabrus* is quite similar, but in *Phascologale* and *Antechinus* the bone is curved, and the deltoid and supinator ridges are very prominent. The greatly elongated radius is straighter in *Antechinomys* than in the allied forms, and consequently is closely applied to the ulna for the greater part of its length, although remaining perfectly free. The bones of the manus are small and delicate.

Fig. 1.

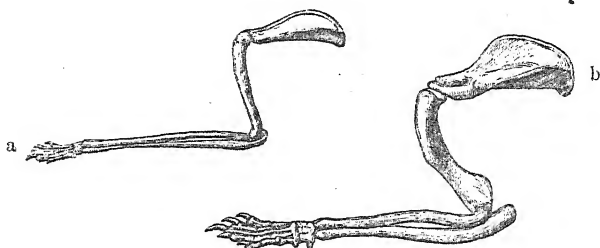
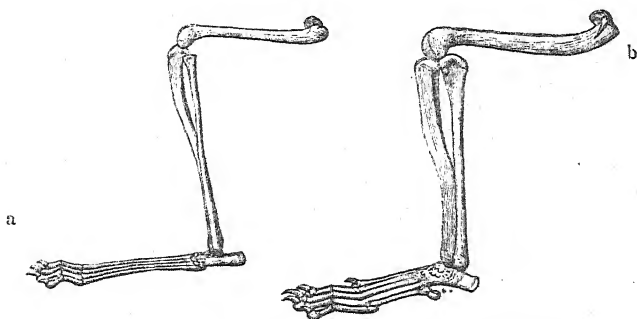
Bones of fore limb of *Antechinomys* (a) and *Antechinus* (b).

Fig. 2.

Bones of hind limb of *Antechinomys* (a) and *Antechinus* (b).

In the *hind limb* (fig. 2) the femur is even more slender than in *Podabrus*, and the lesser trochanter is less developed. The tibia and fibula are elongated; the latter is very slender, the former comparatively stout, and so little curved that it and the fibula, although quite free, are closely applied throughout their lower half; in the other forms these bones are only in contact near their lower extremities. The calcaneum is considerably produced behind, forming a very prominent *tuber calcis*. Only four metatarsals are present (the first being wanting), which are very slender and greatly elongated,



the tarso-metatarsus considerably exceeding the femur in length; in *Phascologale* and *Antechinus* it is only one half, and in *Podabrus* about two thirds as long as the femur. The phalanges of the four digits are short and rather delicate.

### MUSCLES.

In its myology *Antechinomys* does not differ strikingly from its allies, save that the muscles of the lumbar region are more largely developed, especially the ilio-spinal, quadratus lumborum, and psoas magnus. In the limbs the muscles of the lower arm and leg have only a very short fleshy portion, the tendons forming considerably more than half their whole length. It is this that gives the peculiar bird-like look to the forearm and metatarsus of the animal, strongly contrasting with the stout short limbs of *Phascologale* and *Antechinus*, and even with the more delicate structure of *Podabrus*. In the hind foot the best developed muscles are the extensor communis and flexor brevis digitorum; the extensor and flexor pollicis are of course absent.

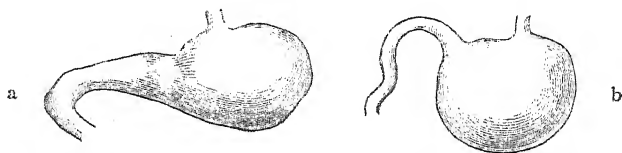
### TEETH.

In dentition I cannot find that *Antechinomys* differs in any appreciable degree from *Podabrus*, or, indeed, from some species of *Antechinus*. The middle upper incisors are curved rather inwards than forwards, and the canines are nearly equal in size to the largest (third) premolars.

### VISCERA.

The *tongue* in *Antechinomys* is long and narrow; the front part marked with transverse furrows, corresponding to the palatal ridges. It is covered with fine filiform papillæ, mixed with a few fungiform; the three circumvallate papillæ are placed in a triangle, and are large, pointed, and directed backwards. In the other forms the tongue is similar, but I was unable to detect the transverse furrows in the specimen of *Phascologale penicillata* examined.

Fig. 3.

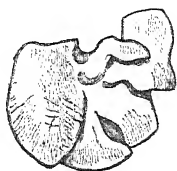


Stomachs of *Antechinomys* (b) and *Antechinus* (a).

The *stomach* (fig. 3) is proportionally large, and is almost globular in shape, with the cardiac and pyloric openings near one another: the epithelial lining is smooth and uniform, with a few slight longitudinal puckers. In *Podabrus* the stomach is of the same form; but in *Phascologale* and *Antechinus* it is very different, being transversely elongated, with a considerably produced fundus, and the pyloric opening is placed at the right extremity.

The *intestine* is perfectly simple and is 6·80 inches long, or little more than twice the length of the animal; I find a similar proportion in *Podabrus macrourus*; while in *Phascologale penicillata* the intestine is less than twice, and in *Antechinus swainsoni* more than three times the animal's length. Possibly the various species may differ in this respect.

Fig. 4.

Liver of *Antechinomys*.

The *liver* (fig. 4) resembles that of its allies, the right lateral lobe being unfissured, while the left is deeply cleft. A gall-bladder is present and the caudate lobe is well developed.

#### CONCLUSIONS.

Before considering the results of the above comparisons, it will be well to glance at the literary history of the present group.

In 1827 Temminck established the genus *Phascogale*<sup>1</sup> (more correctly written *Phascologale*), the type being the *Didelphys penicillatus* of Shaw. *Antechinus* was founded by MacLeay on a drawing and incorrect description of an animal which he at first believed to be an Insectivore<sup>2</sup>; but when he obtained a skeleton, he was doubtful of its distinction from *Phascologale*<sup>3</sup>. It was only adopted by Mr. Waterhouse as a "section" of the latter genus, including the species which have the tail covered throughout with short hair<sup>4</sup>; but it has been generally accepted, and further characters have been pointed by Mr. Krefft<sup>5</sup>. *Podabrus* appears to have been first used by Mr. Gould for the slender-footed *Phascologale crassicaudatus*, but without being characterized<sup>6</sup>. Mr. Waterhouse did not recognize it even as a "section;" and Mr. Krefft only accepts it with the proviso that he "cannot ascertain the true characters beyond what Mr. Waterhouse tells us, that it comprises the *Phascogalæ* with slender feet." He adds, however, some characters of his own, one being "Canines small, seldom exceeding the largest premolar in size;" but this is a point in which there is considerable variation in the species of both *Antechinus* and *Podabrus*. At the same time, as already stated, Mr. Krefft proposed the name *Antechinomys* for the *Phascologale lanigera* of

<sup>1</sup> Mon. de Mamm. i. p. 56.

<sup>2</sup> *Tom. cit.* p. 338.

<sup>3</sup> P. Z. S. 1866, p. 432.

<sup>4</sup> Ann. & Mag. Nat. Hist. viii. (1842) p. 242.

<sup>5</sup> Nat. Hist. Mamm. i. p. 410.

<sup>6</sup> Mamm. Austr. i. pl. xlvii. (1845).

Gould<sup>1</sup>, distinguished by having "only four toes on the hind foot, without any indication of a thumb, the tarsi completely covered with hair, and the underside of the toes and foot alone naked"<sup>2</sup>. A fourth genus of Dasyuridæ, characterized in the same paper, is *Chætocercus*, a form which I only know from Mr. Krefft's description and plate, but which is evidently allied to *Dasyurus* rather than to *Phascologale*<sup>3</sup>.

From the facts noted above it appears to me to be evident that *Phascologale* and *Antechinus* are much more closely allied with one another than they are to *Podabrus* and *Antechinomys*, which, in their turn, are nearly related to one another. If we regard the whole group as a subfamily of the Dasyuridæ, the apparent affinities of the genera might be expressed as follows:—

#### PHASCOLOGALINÆ.

Dental formula i.  $\frac{4-4}{3-3}$ , c.  $\frac{1-1}{1-1}$ , p.  $\frac{2-2}{3-3}$ , m.  $\frac{4-4}{4-4}$  = 46; middle upper incisors larger than the rest, molars with very pointed cusps. Thumb of hind foot small, opposable, nailless, rarely absent. Tail either tufted on the apical portion or clothed with short hairs without.

[a. Arboreal. Hind feet short and broad, soles naked to the heel, with transversely striated pads. Stomach transversely elongated.]

1. PHASCOLOGALE. Middle upper incisors very large, considerably raked forward, with indications of an incipient inner cusp. Pouch absent (*Krefft*). Tail tufted on apical portion, fur soft.

2. ANTECHINUS. Middle upper incisors proportionally smaller, placed more perpendicularly. Pouch present, although sometimes very shallow. Tail clad with short hairs throughout its length.

[3. Terrestrial. Hind feet slender, the sole more or less hairy on the metatarsus, with tuberculated callosities at the base of the toes. Stomach subglobular.]

3. PODABRUS. Pouch present. Limbs moderate; thumb of hind foot present. Tail clad throughout with short hairs.

4. ANTECHINOMYS. Pouch absent. Forearm and hind foot greatly elongate; thumb, with its metatarsus, absent. Tail tufted at its apical portion.

Not having sufficient material for a revision of the numerous described species of *Phascogalinæ*, I will conclude by noting what little is recorded of the life of *Antechinomys*, which is a native of east-central Australia. Mr. Gould's type was obtained by Sir Thomas Mitchell during one of his expeditions into the interior; Mr. Krefft gives "the Lower Murray River district, near the junction of the Darling," as a habitat; and the specimen described above was stated by Mr. L. A. Peers (who presented it to the Cambridge Museum) to have been caught near Cooper's Creek, or the Barcoo, a river which rises in Central Queensland and flows southwards into Lake Eyre, in South Australia. From the structure of the limbs and the characters of the soles of the feet, it is evident

<sup>1</sup> Mamm. Austr. i. pl. xxxiii. (1863).

<sup>2</sup> P. Z. S. 1866, p. 434.

<sup>3</sup> *Tom. cit.* pp. 434, 435, pl. xxxvi.

that it is strictly terrestrial and digitigrade; while the powerful muscles of the loins indicate that, when going at speed, it probably moves by a succession of leaps. Mr. Krefft supports these suggestions from actual observations. The stomach of the Cambridge specimen was unfortunately empty; but the food of the animal is no doubt similar to that of its allies, which are stated to feed exclusively on insects and ants.

2. On some new or rare Species of Chiroptera in the Collection of the Göttingen Museum. By G. E. DOBSON, M.A., M.B., &c.

[Received May 31, 1880.]

(Plate XLVI.)

To the kindness of Prof. Ehlers I owe the opportunity of examining the specimens of Chiroptera in the collection of the Göttingen Museum, among which I find some representing new or rare species. Of these by far the most remarkable is a specimen of a new species of *Megaderma* from Australia, for which, as it is more than double the size of any hitherto described species of that genus, I propose the name of

*MEGADERMA GIGAS*, n. sp. (Plate XLVI.)

In general structure externally agreeing very closely with *M. spasma*, but the relative proportions of parts are somewhat different. Thus the posterior lobe of the tragus, though similarly shaped, is proportionally shorter, while the anterior lobe is much broader at the base, more convex forwards, and obtuse at the tip; the nose-leaf also, though almost identical in shape, is not much larger than that of that species.

While in *M. spasma* the extremity of the second finger does not extend as far as the middle of the first phalanx of the third finger, in this species, as in *M. frons*, it extends beyond it. Tail rudimentary; two short vertebræ only project beyond the extremities of the ischiatic bones, and are quite concealed between the two layers of integument forming the base of the large interfemoral membrane.

The single specimen, an adult male, is very peculiarly coloured, somewhat like the specimen of *M. lyra* in the writer's collection previously described<sup>1</sup>. As in it, the general colour of the fur, ears, nose-leaf, and membranes is white, the base of the fur, upon the upper surface only, being pale slate-blue, the colour so characteristic of the genus: unlike the other known species, the extremity of the carpus, the thumb, and the membrane between the thumb and the second finger are clothed with short hairs, in the type specimen of a white colour.

The teeth scarcely differ in general form from those of *M. spasma*; but, as in the Ethiopian species of this genus, there is no minute

<sup>1</sup> Catal. Chiropt. Brit. Mus. p. 137.

upper premolar, and the dental formula therefore agrees with that of *M. frons*.

The rudimentary premaxillæ resemble more closely those of the Rhinolophidæ than those of any other species of *Megaderma*. As in that family, they project considerably beyond the line of the canines, from which they are also separated by a diastema on either side; and two small depressions in the gum may be seen, which appear to be the empty sockets of a pair of rudimentary teeth, occupying precisely the same relative position as in the species of Rhinolophidæ, an additional indication of the close affinity of the Nycteridæ to that family.

In the skull, as I have generally observed in the larger species of each genus, the sagittal crest is well developed, and the pair of ridges into which it divides in front are so strongly marked as to cause the frontal bones between them to appear considerably hollowed; these ridges terminate on each side in a blunt but well-marked postorbital process, which, however, as in *M. spasma*, is not perforated by a foramen (Plate XLVI. fig. 6). In this respect, therefore, the skull agrees with that of *M. spasma*, which inhabits part of the same zoological region, though apparently agreeing more closely with *M. frons* and *M. cor* in the flattened and expanded frontals and in the absence of a minute upper premolar.

Length (of an adult male), head and body 5"·3; head 1"·9; nose-leaf 0"·6; ear 2"·2; tragus—anterior lobe 0"·45, posterior lobe 1"·0; forearm 4"·2; thumb 0"·8; second finger—metacarpal 3"·3, phalanx 0"·6; third finger—metacarp. 2"·7, 1st ph. 1"·85, 2nd ph. 3"·6; fourth finger—metacarp. 3"·1, 1st ph. 1"·0, 2nd ph. 1"·5; fifth finger—metacarp. 3"·3, 1st ph. 1"·25, 2nd ph. 1"·1; tibia 1"·7; calcaneum 1"·1; foot 1"·1.

*Hab.* Mount Margaret, Wilson's River, Central Queensland, Australia. (Captured by Mr. Wilson.)

This specimen, sent by Dr. Schuette to the Göttingen Museum, is the same as that mentioned by Mr. G. Krefft, C.M.Z.S., in a communication read before the Society in May 1879 (see P. Z. S. 1879, p. 386). It was accompanied by the following note on the colour of its fur and integuments:—

"Flughäute, Ohren, und Nasenblatt fleischfarbig. Alle Haare auf diesen Theilen weiss, auf dem Rücken sind die Haare bleifarbig. Die Haut welche die Ohren verbindet ist tief blutroth."

#### RHINOLOPHUS PETERSI, Dobson.

An adult male from Sumatra, thus indicating the Oriental as the zoological region to which this species (of which the habitat was unknown) belongs. The only difference observable between this and the type specimen is that the free extremity of the tail does not project so far as in the latter.

#### VESPERUGO MAURUS, Blasius.

Two specimens in the collection must, I believe, be referred to this species, though they are said to have been received from localities many thousands of miles apart. One from Tuscany was sent to the

Göttingen Museum in 1847, by Prof. Savi, and was labelled by him "*Vespertilio savii*, Bonap."<sup>1</sup>; the other is stated to have come from a collection made by Degenhardt at Popayan in the U.S. of Columbia, South America, in 1844.

Neither in the general external form and in the dentition, nor in the relative measurements, have I been able to find the least difference of importance between these specimens, except such as depend upon the immature condition of that from Tuscany, which, as shown by the extremities of the finger-bones, had not attained its full size. The following are the measurements of these specimens:—

	Tuscany. inch.	Popayan. inch.
Length, head and body .....	1·7	1·8
„ head .....	0·63	0·65
„ tail .....	1·45	1·3
„ do. free from membrane .....	0·15	0·15
„ ear .....	0·5	0·5
„ tragus .....	0·2	0·2
„ forearm ..	1·3	1·3
„ thumb .....	0·2	0·2
„ third finger, metacarpal .....	1·15	1·15
„ „ „ 1st phalanx .....	0·4	0·45
„ „ „ 2nd phalanx ..	0·55	0·55
„ fifth finger, metacarpal ..	1·1	1·1
„ „ „ 1st phalanx .....	0·28	0·3
„ „ „ 2nd phalanx .....	0·2	0·2
„ tibia .....	0·45	0·45
„ foot .....	0·22	0·22

As Blasius has remarked in his description of *V. maurus*, the first upper premolar is extremely small in both these specimens. In that from Tuscany I had considerable difficulty in finding it even with the aid of a lens. This at once accounts for Bonaparte's mistake when describing the dentition of *V. savii*.

<sup>1</sup> *Vespertilio savii*, Bonap., and the other species (*V. leucippe*, *V. aristippe*, *V. aleythoi*) described by Bonaparte (Fauna Italica, 1837), are not included by me in the 'Catal. Chiropt. Br. Mus.' because, in the first place, I was unable to obtain an examination of the types, which appear to be in the possession of Mr. R. F. Toms, and are noticed by him to have been in a very bad state when he received them from Prince Bonaparte in 1857 (see P. Z. S. 1858, p. 81), and, secondly, because the descriptions in the 'Fauna Italica' were quite insufficient to enable me to assign places to them in my work. Thus, had I followed Bonaparte's original, and Keyserling and Blasius's subsequent description (Wiegmann, Archiv, 1839, p. 317) of *V. savii*, that species must have been placed in the subgenus *Vesperus*; while *V. maurus*, Blas., which is evidently another name for the same species, would have appeared, as it rightly does, among the species of the subgenus *Vesperugo*. I say "evidently," for it appears quite clear to me that Prof. Savi knew the species with which his name had been associated, and sent a correctly named specimen (though not the type of the species) to the Göttingen Museum, which corresponds in all respects, except in dentition, with the descriptions referred to above. Nevertheless, I retain Blasius's name "*Vesperugo maurus*," given in 1853, in preference to Bonaparte's, as, for the reasons I have given, it is impossible to be absolutely sure that it is a synonym of *V. savii*.

The presence of a single specimen in a collection labelled "Popayan" is, of course, not sufficient grounds to extend the distribution of this species to the Neotropical Region, the Chiroptera of which (with one exception only, *Vesperugo serotinus*, as I have shown<sup>1</sup>) are quite distinct from those of any of the zoological regions of the eastern hemisphere. There are, however, in the same collection several other specimens of species, evidently Neotropical, which are labelled "Popayan" (to be referred to hereafter), and with which this specimen agrees precisely in the state of preservation. It is also noteworthy that *V. maurus* has been found in Europe at very high elevations only along the Alps; and in this respect the South-American habitat given agrees very well, for Popayan is situated in an elevated plain in the Andes, 6000 feet high.

If, then, specimens of this species have really come from such very distinct and distant zoological regions, and exhibit so few differences, it becomes evident that we must consider the Oriental representative of this species, described under the names *Vesperugo mordax*, Ptrs., and *V. austenianus*, Dobson, as a distinct species, which, although agreeing remarkably in general structure, and even in the colour of the fur, with *V. maurus*, differs in its conspicuously greater size (forearm 1"·6), in the very shallow emargination in the upper half of the outer margin of the ear-conch, in the considerably less degree in which the extremity of the tail projects from the interfemoral membrane, and in the much greater development of the first upper premolar, which, although the second premolar is also close to the canine, may be seen without difficulty from without.

#### VESPERTILIO NIGRICANS, Wied.

Two specimens referable to this species, one from Cordova, Argentine Republic, the other from Popayan, U.S. of Columbia. The latter, an adult male, has the forearm 1·5 inches long, and the digits proportionally longer, but in other respects quite agrees with specimens from other localities in which the forearm rarely exceeds 1·35 inch. Can it be that individuals of this and of other species inhabiting very elevated regions have larger wings to compensate for the very rarefied condition of the atmosphere?

#### SCHIZOSTOMA MEGALOTE, Gray. Popayan.

#### LONCHOGLOSSA WIEDI, Ptrs. Popayan.

The following are the measurements of an apparently adult male specimen preserved in alcohol (the zygomatic arches are cartilaginous):—

	inches.
Length, head and body .....	2·5
„ head .....	1·1
„ tail .....	0·15
„ ear .....	0·6

<sup>1</sup> Catal. Chiropt. Brit. Mus. p. 157.

	inches.
Length, forearm .....	1·6
„ thumb .....	0·35
„ third finger, metacarp. ....	1·5
„ „ „ 1st ph. ....	0·5
„ „ „ 2nd ph. ....	0·8
„ „ „ 3rd ph. ....	0·5
„ fourth finger, metacarp. ....	1·45
„ „ „ 1st ph. ....	0·4
„ „ „ 2nd ph. ....	0·55
„ fifth finger, metacarp. ....	1·25
„ „ „ 1st ph. ....	0·35
„ „ „ 2nd ph. ....	0·5
„ tibia .....	0·55
„ foot .....	0·38

ARTIBEUS QUADRIVITTATUS, Ptrs. Popayan.

CHIRODERMA SALVINI, Dobson. Popayan.

An adult male specimen of this species, with faintly marked facial streaks, and a very narrow white line in the fur along the lower half of the spine. This shows that the white streaks are as variable in this species as I have already noticed in the case of *Artibeus planirostris* (Catal. Chirop. Br. Mus. p. 516). The important structural characters on which the species depends are, however, as well marked in the only specimen hitherto known (the type, in the collection of the British Museum), which was collected by Mr. Salvin in Costa Rica, and named by me after the discoverer.

#### EXPLANATION OF PLATE XLVI.

Fig. a. *Megaderma gigas*, natural size.  
b. Skull of *Megaderma gigas*.

### 3. On the Anatomy of *Leptosoma discolor*.

By W. A. FORBES, B.A., F.L.S., Prosector to the Society.

[Received May 28, 1880.]

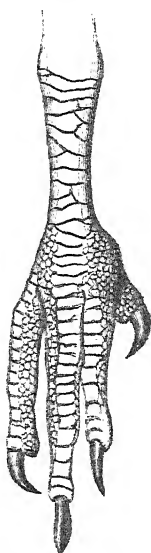
It is to the liberality of my friend Prof. A. Newton that I am indebted for the opportunity of dissecting a female example of this bird, the most peculiar, perhaps, with the exception of *Mesites*, of all the anomalous forms that Madagascar produces. Till the past year or two our knowledge of the structure of *Leptosoma* was almost confined to its skin and certain parts of its skeleton.

Mr. Sclater, in this Society's 'Proceedings' (1865, pp. 682-689; also in Nitzsch's 'Pterylography,' Ray Soc. ed. App. ii. p. 158) has already given us an account of the different views that have at various times been held by ornithologists as to the position of this peculiar form; and he was also the first to point out the existence



in it of powder-down patches, as well as other of its peculiarities. Since then I am unaware of any thing more having been done to elucidate its structure till 1878. In M. Grandidier's magnificent work on Madagascar<sup>1</sup>, in the plates of the Atlas devoted to the birds, M. A. Milne-Edwards has figured the entire skeleton, together with separate views of the bones, as well as the tongue and alimentary canal, and has likewise given pictures of the bird when plucked, showing the external nares, the position and shape of the powder-down patches, and its naked oil-gland. In reply to my inquiries on the subject, M. Milne-Edwards kindly replied that he intended to describe in full the osteology of *Leptosoma*, together with that of *Atelornis*,

Fig. 1.



Right foot of *Leptosoma* (nat. size), seen from before, to show the disposition of the toes. (The fourth toe is slightly removed outwards, to better show its position.)

*Brachypteracias*, &c., of which figures are given also in the above-named work, in the text, but that, as regards other points, only an explanation of the plates was to be given. I have therefore thought it would be of interest to bring before the Society some additional notes on its pterylosis and soft parts, derived from my examination of Prof. Newton's specimen.

Before proceeding further, I should like to call attention to the structure of the feet in *Leptosoma*, which has already been accurately described by Mr. Sclater (*l. c.* p. 688). They are in no way "zygodactyle," in the sense in which that term is applied to the feet of such

<sup>1</sup> Hist. Phys. nat. et pol. Madag., Zool., Ois. pls. 85-88.

birds as the Cuckoos, Parrots, or Toucans. In this spirit-preserved specimen it is easily demonstrable that the fourth digit cannot naturally be placed in a really reversed position, like that of the above-named birds. While the second and third toes look directly backwards, the hallux looks inwards and forwards, and the fourth toe *inwards* and slightly *backwards* at its apex, there being, as it were, a slight twist in its axis<sup>1</sup>. However much the fourth toe is bent backwards (and this is only done by the exercise of some little force), its plantar surface always looks more or less inwards. The presently-to-be-described arrangement of the deep plantar tendons also confirms the view here taken as to *Leptosoma* not being a true zygodactyle bird.

*Pterylosis*.—As regards *Leptosoma*, Nitzsch only noted the presence of an aftershaft and 12 rectrices, he only having been able to examine a stuffed specimen. Mr. Sclater, in his above-mentioned paper, besides describing the two characteristic lumbar powder-down patches of this bird, briefly alludes to the pterylosis, which “appears nearly similar to that assigned by Nitzsch to *Coracias* and *Eurystomus*.” These features are diagrammatically represented in a woodcut (fig. 5, l. c.).

The following is a more detailed description:—

The inferior tract divides about 1 inch behind the junction of the rami of mandible—the (badly) so-called “chin-angle”—from which it starts as a narrow, single tract<sup>2</sup>. Between this tract and the mandibular rami, extending as far as the angle of the jaw, a narrow naked space is left; at this point the inferior tract becomes continuous with the feathering of the head above, so that here the neck, except for the narrow median ventral *apterium*, is continuously feathered. This continuous feathering extends downwards till about  $\frac{3}{4}$  inch above the shoulder, when, the inferior and dorsal tracts diverging, the lateral neck-space is formed. The inferior tracts diverge gradually as they approach the breast, and then run parallel to each other over the pectoral muscles and abdomen to the sides of the vent, leaving a rather wide bare carinal space, with a few scattered down-feathers. As the inferior tract emerges on the breast, it gives off a branch to the anterior margin of the *patagium*; and this at first is dilated somewhat, so that the space between it and the main tract is feathered. The broad humeral tract is also connected with the inferior tract where the latter gives off this patagial branch. In the lower part of the neck the inferior tract is about 8 feathers broad, on the breast about 6, and on the abdomen only 2. About the middle of the sternum the outer pectoral tract, which is about 4 feathers wide and slightly stronger than the main tract, is given off; it is

<sup>1</sup> This disposition of the fourth toe makes *Leptosoma*, at first sight, look as if it had three toes anteriorly directed, and no doubt accounts for Mr. Sharpe entirely omitting any notice of its peculiar feet in his paper on the *Coraciidae* (cf. *Ibis*, 1871, pp. 187, 285).

<sup>2</sup> In *Coracias garrula* the naked median space left between the halves of the inferior tract extends quite up to the symphysis, so that the inferior tract is double from the commencement.

not very divergent, but is dilated terminally, and develops a recurrent hook, which, however, is not very distinct. There is a circlet of feathers round the vent, and a short tract of feathers behind it, on each side of the fleshy part of the tail, continuing the direction of, though quite separate from, the main inferior tract of its side.

The feathering of the head above is continuous, and from it the anterior moiety of the dorsal tract runs, being anteriorly continuous at the sides, as already noted, with the inferior tracts, along the dorsal median line of the neck, as a rather broad, thickly feathered band, which forms a strong interscapular fork, just as in *Coracias* and the Parrots, the ends of the fork lying about  $\frac{1}{4}$  inch anterior to the posterior extremities of the two scapulæ. The posterior moiety has also a forked form, the two arms enclosing a fairly broad naked median space, and only uniting about 1 inch in front of the oil-gland, the united tract so formed ceasing altogether about  $\frac{1}{4}$  inch in front of that organ. This posterior fork is very narrow anteriorly, not more than two feathers wide; indeed, for the first two or three rows each arm consists of only one feather in each row, and the two arms run in between the forks of the anterior moiety, just as in the Parrots, *Coracias*, and some other birds. Posteriorly the fork widens, and becomes connected closely with the scattered contour-feathers which are found outside it, over the space between the dorsal tract proper and the lumbar powder-down patches, so that on the rump the dorsal tract appears to consist of five or six rows of feathers on each side of the median line. There is a very strongly feathered and broad band of feathers over the knee, being the anterior end of the lumbar tract of its side; this tract is quite distinct from all others but the crural, which are much weaker and clothe the leg as far as the "ankle." The powder-down patches, one on each side, lie between the posterior portion of the dorsal tract and the lumbar tracts. They form elongated patches, extending forwards over the femur as far as the *sartorius* muscle, and backwards to within  $\frac{1}{2}$  inch of the vent; their dorsal border is parallel to the dorsal tract, the ventral to the lumbar ones. On the inside of the skin they are conspicuous as dark grey patches, formed by the closely aggregated insertion of the feathers of which they are composed, these lying at a less angle with the skin than the contour-feathers. Nitzsch<sup>1</sup> has described the pterylosis in *Coracias garrula* and *C. indica*, with figures of that of the former, and in *Eurystomus gularis*. I have examined the first-named species in the flesh, and also a skin of *Atelornis crossleyi*. In all essential respects, as will be seen by a comparison of the above description with Nitzsch's figures of *Coracias garrula*, *Leptosoma* is essentially Coraciine, though it differs from all others of that group in its possession of powder-down patches<sup>2</sup>.

<sup>1</sup> Pterylogr. (Ray Soc. ed. p. 89).

<sup>2</sup> I may here mention that *Atelornis crossleyi* differs as regards its pterylosis but slightly from the Coraciine type. It has the same interrupted dorsal tract, each half having a furcate form; but here the interscapular fork is very short and narrow, and does not enclose the anterior part of the posterior fork,

In the Cuculidæ the dorsal tract, though it divides between the shoulders, is perfectly continuous throughout, enclosing an elongated oval space (*vide* Nitzsch's figures of *Cuculus canorus* and *Centropus rufipennis*, *l. c.* pl. iv. figs. 12 & 14). In the Cuculidæ too, as is well known, the aftershaft is absent and there are but 10 rectrices. I may remark that in the possession of an *interseapular* dorsal fork the Coraciidæ and *Leptosoma* form an exception to Prof. Garrod's generalization<sup>1</sup> that when "the dorsal tract develops a fork *between* the shoulder-blades a bird is homalognatous."

*Visceral Anatomy.*—The mucous membrane of the palate and mouth is smooth throughout, except along the margins of the nasal aperture, where it develops three or four small blunt retroverted tubercle-like papillæ on each side, and also external to this on each side along a line parallel to the axis of the palatine bones, where there is a similar short row of small papillæ.

The tongue is tapering and elongated in shape; its length is  $1\frac{1}{2}$  inch. The basal part, which alone is fleshy, and supported by the hyoid bones, is of a triangularly sagittate shape, about  $\frac{1}{2}$  inch long, and provided at its postero-external angles with a few minute, blunt, retroverted papillæ; it is prolonged forwards into a horny lamina, which is strongly concave above and forms the greater part of the tongue; at its apex the part, which is of a slightly tapering shape, is apparently entire<sup>2</sup>. This tongue closely resembles that of *Coracias*, and differs from that of such of the Cuculidæ as I have examined in wanting the well-developed retroverted spines that are always present on the posterior part of the lateral margins in those birds<sup>3</sup>.

The oesophagus is capacious at first, but rapidly narrows; it develops no crop. The proventriculus is zonary, being  $\frac{1}{2}$  inch deep. The stomach is globose and not strongly muscular; there is a distinct pyloric bulb indicated externally at the commencement of the duodenum. Internally it is lined with rather soft epithelium, which is concentrically striated. In the present example the stomach contained hairs, apparently of lepidopterous larvæ, and the horny jaws and other hard parts of insects; many of the smaller hairs had become impacted in the soft lining of the stomach, so that this at first sight appeared to be villous. The same appearance has often been described in our common Cuckoo<sup>4</sup>.

The intestines in all measure  $12\frac{1}{2}$  inches, of which  $2\frac{3}{4}$  are "large;" they are not markedly capacious. The cæca<sup>5</sup> are long and cylindri-

---

which has a long stem or "handle." There are the same strong lumbar tracts. Below, the outer pectoral tract, given off on the middle of the breast, is only indicated by an enlargement of the main tract, and is not at all free. There are no traces of powder-down patches.

<sup>1</sup> P. Z. S. 1878, p. 931.

<sup>2</sup> The tongue of *Leptosoma* has been figured by Mr. Sclater (*l. c.* p. 688), and also by M. A. Milne-Edwards (*l. s. c.* pl. 88. fig. 1).

<sup>3</sup> *Vide* also the figures of the tongues of *Cooua gigas* (pl. 63. fig. 1) and *C. olivaceiceps* (pl. 64. figs. 1, 2) in Grandidier's work.

<sup>4</sup> Cf. Hunter's Essays and Observations, ii. p. 285 &c.

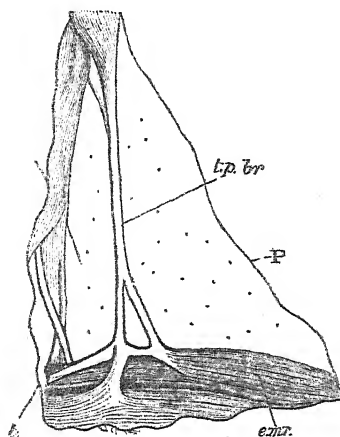
<sup>5</sup> Figured, with other parts of the intestinal canal, by M. Milne-Edwards, *l. c.* pl. 88.

cal in shape, largest apically, and slightly tapering towards their bases; they measure respectively  $2\frac{1}{4}$  and  $2\frac{3}{4}$  inches. The liver has the left lobe much the smallest; there is a distinct gall-bladder.

There is thus nothing striking or characteristic about the alimentary canal. In the possession of large cylindrical cæca, *Leptosoma* agrees with both Coraciidæ (including *Brachypteracias* and *Geobiastes*) and Cuculidæ, as also in most of the other points noted. In the Cuckoos, however, the gall-bladder is *said* to be absent as a rule<sup>1</sup>.

*Myology* &c.—The first pectoral is big; the second extends

Fig. 2.



Wing-muscles of *Leptosoma*.

Termination of the *tensor patagii brevis* (*t.p.br.*) in *Leptosoma*. *e.m.r.*, the fleshy belly of the superficial layer of the *extensor metacarpi radialis longior* muscle; *z*, the tubercle on the humerus, whence it arises; above it the humerus. *P*, the *patagium*, its dorsal layer having been removed to show the muscles, &c.

at least halfway down the sternum; the third is not represented. There is no *biceps*-slip to the patagium, as is the case in all "Anomalogonatæ" except the Caprimulgidæ. In none of these points does *Leptosoma* differ from the Coraciidæ or Cuculidæ. The *expansor secundariorum* is present and well developed; its proximal end is T-shaped ("*ciconiiform*," Garrod), the sternal part of the tendon being attached to that bone at the junction of the costal process with the body near the coracoid groove; it therefore resembles

<sup>1</sup> Owen, *Anat. Vert.* ii. p. 177. Gadow also states its absence in *Cuculus*. Hunter, on the other hand, found it, though "very small," in *C. canorus* (*l. s. c.* p. 285). According to the plates in Grandidier's work, *Coua gigas* has a gall-bladder (pl. 63); so has *Geobiastes squamigera* (pl. 99. fig. 2).

the same muscle in the Coraciidæ. In no other birds amongst the Anomalogonatæ is this muscle present. In the Cuculidæ this muscle is present, but its terminal tendon is *not* T-shaped, the sternal moiety being undeveloped.

The arrangement of the termination of the *tensor patagii brevis* is represented in the accompanying figure (fig. 2, p. 470).

The main tendon (*t.p.br.*) runs on to the ulnar side of the arm, and there becomes fused with the fascia covering the muscles. Before doing so, however, it crosses the superficial tendon of origin of the *extensor metacarpi radialis longior* (*e.m.r.*), which springs from the humeral tubercle, and becomes firmly blended with it.

It likewise sends off, distally, a special slip of tendon which joins the same tendon of that muscle more externally (wristward). This is much the same arrangement as in the Coraciidæ, as described and figured by Prof. Garrod (P. Z. S. 1876, p. 511, pl. 49. fig. 1), except that in those birds the tendon of the *tensor patagii brevis* is split into two quite separate halves; if these were united together, an arrangement would be arrived at practically identical with that of *Leptosoma*. In the Cuculidæ the condition of things is quite different, as in them the "undivided tendon runs on to the ulnar superficial fascia without any complication" (*l. c.* p. 512).

Of the leg-muscles, the *gluteus primus* is present, though small, only slightly overlapping the *biceps*, and with its fleshy part not reaching the innominate, to which it is attached only by fascia. The *ambiens* is absent; the *femoro-caudal* is very large, but lacks the accessory head, as in all Anomalogonatæ. Both the *semitendinosus* and its accessory are well developed, as is the *semimembranosus*. The *biceps cruris*, as usual, passes through a tendinous loop. The *obturator externus* is well developed, and the *obturator internus* is of a very elongated oval shape. The formula of *Leptosoma* is therefore — . A . X . Y, exactly the same as that of the Coraciidæ and the greater number of Anomalogonatous birds. In the Cuculidæ the *ambiens* is *always* present and well developed, and the *accessory femoro-caudal* usually so<sup>1</sup>, giving a formula of + . A . (B) . X . Y. *Leptosoma* is therefore clearly *not* Cuculine. In the Cuculidæ, too, the *obturator internus* is triangular in shape, as in the Gallinæ and their allies; in *Leptosoma*, as already stated, as in *Coracias*, it is oval.

The anomalous arrangement of the toes in *Leptosoma* made me very anxious to observe the disposition of its deep plantar tendons, these, in all "zygodactyle" Anomalogonatous birds, being arranged in a manner quite unique amongst birds and entirely different from that which obtains in the even-toed *Homallogonatus* birds (*i. e.* the Psittaci, Cuculidæ, and Musophagidæ)<sup>2</sup>.

But in *Leptosoma* neither of these conditions occurs; on the contrary, the disposition of its plantar tendons is exactly that found in many birds with feet of the ordinary structure. This condition is

<sup>1</sup> It is absent only in *Cuculus*, *Chrysococcyx*, and *Cacomantis*. [Garrod's MSS.]

<sup>2</sup> Vide Garrod, P. Z. S. 1875, p. 345.

diagrammatically represented in fig. 3; as will there be seen, the tendon of the *flexor longus hallucis* (*f.l.h.*) joins the tendon of the *flexor profundus digitorum* (*f.p.d.*) on the outer side, some little way above the phalanges, and completely blends with it. From the single compound tendon so formed the small slip to the hallux is given off, on the inner side, just before the common tendon splits up for distribution to the three other digits. This is exactly the same condition as that found by Prof. Garrod in *Coracias garrula*, and by myself in *Atelornis crossleyi* (in a skin).

It differs completely from that found in the Psittacidae, Cuculidae, and Musophagidae on the one hand, and that of the Galbulidae, Bucconidae, and Picidae and their allies on the other. Therefore this fact, when taken in conjunction with the statements already made as

Fig. 3.

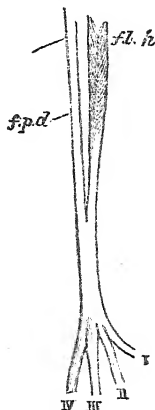


Diagram of the arrangement of the deep plantar tendons in *Leptosoma*. *f.l.h.*, the *flexor longus hallucis*; *f.p.d.*, the *flexor profundus digitorum*.

to the natural position of the fourth digit in *Leptosoma*, shows that there are no real grounds for calling *Leptosoma* a "zygodactyle" bird<sup>1</sup>.

As regards other points, it may be mentioned that the vessels and nerves of the thigh are normal; that is to say, the sciatic nerve and artery and the femoral vein are all present in their normal position.

There are two carotid arteries present, both of them being unusually small, the left particularly so. They run up in the usual converging way, springing from the vertebral arteries into the hypophyseal canal of the neck, and there become so closely applied to each other that it is impossible to dissect them away as can usually

<sup>1</sup> In *Podargus cuvieri*, where the outer toe is reversed in perching, and in *Colius*, where the toes are directed at various times in very different ways, the "same blended" distribution of the deep plantar tendons obtains.

be done in birds. As far as I can make out, they do not, however, fuse, but are continued up to the head and there diverge. In *Opisthocomus*<sup>1</sup> Prof. Garrod found a somewhat similar condition, though he says nothing about the vessels being minute. In *Leptosoma* they have the appearance of white fibrous cords, and they may possibly be, like the carotids of *Bucorvus*<sup>2</sup>, no longer functional as blood-channels. But satisfactorily to decide this, as well as the ultimate termination of these carotids, fresh or injected specimens will be necessary.

In both the Cuculidæ and Coraciidæ there are two equisized carotids, which are as free as usual.

As regards the vocal organs, there are present but one pair of extrinsic muscles, which diverge to be attached to the "costal processes" of the sternum. The syrinx possesses a single pair of

Fig. 4.

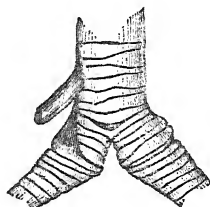


Fig. 5.

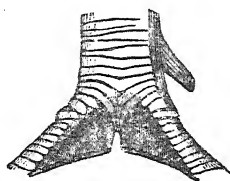


Fig. 4. The syrinx of *Leptosoma* seen from in front, the muscles of the left side having been removed.

Fig. 5. The same, from behind. (Both are twice the natural size.)

intrinsic muscles, as usual. This organ having been previously unknown in *Leptosoma*, I here take the opportunity of describing and figuring it.

The tracheal rings, which, as usual, interlock with each other for the greater length of the trachea, are well ossified, and only separated by narrow intervals. They gradually narrow as they approach the thorax, the last two being the narrowest of all. The penultimate tracheal ring is produced downwards in a triangular way behind, as is the terminal one in front; behind, this last ring bears the anteriorly-directed narrow pessulus, which intervenes behind between the inturned ends of the first pair of bronchial semirings, but in front does not appear, stopping short before it reaches the anterior surface of the bifurcating trachea.

Like the tracheal rings, the first three bronchial semirings are well ossified, and separated from each other only by very narrow interannular intervals. They are nearly straight, with only a very slight concavity upwards, and increase in depth as they descend. In front the semirings of opposite sides are separated from each other by

<sup>1</sup> P. Z. S. 1879, p. 112.

<sup>2</sup> Vide Mr. Ottley's paper on this bird, P. Z. S. 1879, pp. 461-467.



a small notch; behind they are less and less complete as they go downwards. The first semirings are posteriorly closely applied to, though separate from, the pessulus, and are apparently continued on, as cartilaginous rings, posteriorly, so as to form complete or nearly rings. The posterior ends of the second and third semirings where they appear behind are widely separated from their fellows of the other side. The fourth and succeeding bronchial rings are all cartilaginous. Of these the fourth is the largest, being nearly straight, and slightly more prominent than the others. To its middle, rather towards its posterior margin, is attached the (single) intrinsic syringeal muscle. The rings succeeding the fourth ring rapidly become more and more complete, at the same time that the bronchus becomes less capacious, the whole tube tapering away from this ring as it approaches the lung. The fifth and sixth semirings are more slender than those that succeed them, and are slightly concave upwards. The remaining ones are straighter and deeper. Except between the fourth and fifth, and fifth and sixth semirings, the inter-annular intervals are exceedingly narrow.

This syrinx does not show much similarity of form to that of *Coracias garrula*, the only one of the family of Coraciidæ that I have been able to examine as regards this point. At the same time it does not much resemble that of any Cuckoo I am acquainted with.

Reviewing the facts already stated, it is clear that the affinities of *Leptosoma* to the Cuculidæ are very remote, whilst, on the contrary, its relations to the Coraciidæ are quite the reverse. The subjoined tabular statement of the principal points in the structure of the three just named groups will perhaps render this additionally clear:—

	Tail-feathers.	Aftersh.	Oil-gland tuft.	Ambiens.	Fem.-caud.	Acc. f.-c.	Semitend.	Acc. semit.	Exp. second.	Obl. int.	Carotids.	Cæca.
Cuculidæ ...	10	—	—	+	+	+	+	+	peculiar	triangular	2	+
Leptosoma...	12	+	—	—	+	—	+	+	ciconiine	oval	2	+
Coraciidæ ...	12	+	—	—	+	—	+	+	ciconiine	oval	2	+

In common with both Cuculidæ and Coraciidæ, *Leptosoma* possesses a nude oil-gland and long cæca, two carotids, and the femoro-caudal, semitendinosus, and accessory semitendinosus muscles. Wherever there is any difference, *Leptosoma* resembles the Coraciidæ; and the same story is told by the pterylosis and *tensor-patagii* arrangement.

Nevertheless, both in the syrinx and in these last two points, as well as in some others, especially osteological ones<sup>1</sup>, *Leptosoma* is not quite typically Coraciine, and it may therefore be retained, as

<sup>1</sup> Vide Grandidier's work, Atlas, Ois. pls. 85, 86.

was proposed by Mr. Selater, as the type of a peculiar family, Leptosomidæ. This should be placed in the series of Passeriform Anomalogonatus birds as defined by Prof. Garrod<sup>1</sup>, next to the Coraciidæ, with which its relations are most intimate. Indeed it is possible that, when the anatomy of the allied genera, *Brachypteracias*, *Geobiastes*, and *Atelornis*<sup>2</sup> becomes fully known, the truth of Mr. Sharpe's proposition<sup>3</sup>, that *Leptosoma* should be relegated to the position merely of a subfamily of the Coraciidæ, may be established.

4. On two rare Ploceine Birds now or lately living in the Society's Menagerie. By W. A. FORBES, B.A., F.L.S.,  
Prosector to the Society.

[Received June 2, 1880.]

(Plate XLVII.)

1. *VIDUA SPLENDENS*. (Plate XLVII. fig. 1.)

*Vidua splendens*, Reichen. Orn. Centralbl. 1879, p. 114.

On the 17th of July, 1878, Mr. Archibald Brown presented to the Society, with some other birds, a specimen of a small Weaver-bird, which, being then "out of colour," was entered on the list of additions as *Vidua principalis*, the common and well-known "Pin-tailed Whydah bird." Last summer this bird had assumed an entirely blue-black plumage, like that of *Hypochera nitens*, also a common cage-bird. But I was struck by the appearance of the beak and feet, these being of a bright coral-red colour, whereas in *H. nitens* they are only pale flesh-coloured. The tail-feathers, too, were slightly tipped with white, and the two central ones became gradually slightly more lengthened than the others, and so projected beyond them. The accompanying figure (Plate XLVII. fig. 1) shows the appearance of this bird at that time, as sketched from life by Mr. Smit. Unfortunately it died on the 29th of March in the present year, being then in very poor plumage, as it was moulting; on dissection it proved to be a male. Thinking I had here a new species of *Hypochera* to deal with, I took the skin with me, on a late visit to Berlin, to show to Drs. Hartlaub, Cabanis, and Reichenow. The latter gentleman speedily recognized this bird as the young male of a species he had lately described from E. Africa as *Vidua splendens* (Orn. Centralbl. 1879, p. 114). Of this only a single specimen was collected at Kibaradja, E. Africa, by Dr. Fischer, and is now in the Berlin Museum. A sketch from this bird is reproduced in the distant figure of the accompanying Plate; as will be seen from it, the male bird, when fully adult, possesses enormously elongated rectrices, the two of each

<sup>1</sup> P. Z. S. 1874, p. 119, and Z. c. 1878, p. 99.

<sup>2</sup> The osteology of these genera, with some other points, is figured in Grandidier's work on pls. 97-99, 101, 102, 103a.

<sup>3</sup> Ibis, 1871, p. 187.

side fitting into each other, so that at first sight there only appear to be *two* on each side. The excess of these four central tail-feathers over the other rectrices is, in this specimen, nearly 6 inches: in the young male that lived in our Gardens, there are only two lengthened feathers, which project only to the extent of  $\frac{1}{2}$  inch. If our bird had lived, the other two tail-feathers would, no doubt, have been duly developed, the birds in other respects being nearly similar. In our specimen all the rectrices, including the two central ones, are slightly tipped with white: the eyes were very dark red-brown. *Vidua splendens* is perhaps most like *Vidua hypocherina* of Verreaux<sup>1</sup>; from that species it can be at once distinguished by the absence of the white, elongated rump-feathers. *Vidua (Hypochera) nitens* is also entirely blue-black, but has *no* lengthened rectrices, and, moreover, has the feet and beak flesh-colour; in *V. principalis* the beak is also bright red, but the feet are fleshy, besides many other differences. The discovery of this bird renders, in my opinion, the retention of the genus *Hypochera*, founded by Bonaparte<sup>2</sup> in 1850, for *Fringilla nitens* unnecessary—the males of *V. splendens* and *V. principalis*, as well as probably *V. hypocherina*<sup>3</sup> when in winter plumage, as well as the females and young males at all times, being indistinguishable by any characters, structural or otherwise, from that section of the group including *V. nitens* and *V. nigerrima* (*Hypochera nigerrima*, Sharpe, P. Z. S. 1871, p. 133), in which the male has, in nuptial plumage, no elongated rectrices.

Our specimen was said to be from the "east coast of Africa," a fact rendered probable by the arrival along with it of specimens of *Euplectes nigriventris*<sup>4</sup>, a truly eastern species.

## 2. PYTELIA WIENERI. (Plate XLVII. fig. 2.)

*Pytelia wieneri*, Finsch, Gef. Welt, Aug. 9, 1877.

*Pytelia cinereigula*, Cab. Orn. Centralb. Dec. 1, 1877, et J. f. O. 1878, p. 101.

In the 'Gefiederte Welt' (6th Jahrg. no. 32, p. 317) for Aug. 9th, 1877, Dr. Finsch described as new, under the above title, a species of *Pytelia*, of which Mr. A. F. Wiener, F.Z.S., had purchased four living specimens in London, supposed to be from "Australia." On June 18th, 1879, Mr. Wiener presented one of these specimens to the Society, which is still (May 31) living in the Parrot-house in good health. From it the accompanying drawing has been taken (Plate XLVII. fig. 2).

In the 'Ornithologisches Centralblatt' for Dec. 1, 1877 (p. 182),

<sup>1</sup> *Vidua hypocherina*, J. and E. Verreaux, Rev. et Mag. Zool. 1856, p. 260, t. 16.

<sup>2</sup> C. R. xxxi. p. 434.

<sup>3</sup> *Vidua superciliosa* (Vieill. Gal. Ois. pl. 61) I only know by the plate and descriptions: it is said to have only *two* elongated rectrices; as there are said to be ten of the ordinary length, this statement is therefore probably correct.

<sup>4</sup> Cassin, J. Ac. Phil. 1849, p. 242, pl. xxxi. fig. 1. Erroneously entered in the register (P. Z. S. 1878, p. 1008) as *E. oryx*. Cf. List Vert. 1st supplement. 1879, p. 65.

Dr. Cabanis described a *Pytelia*<sup>1</sup> *cinereigula*, of which there had been two specimens lately received at the Berlin Museum from East Africa. One of these had been collected at Zanzibar by Dr. Fischer, the second at Mombassa by Drs. Hildebrandt and von Kalkreuth. During my late visit to Berlin I at once recognized in this species Finsch's *Pytelia wieneri*; and by the kindness of Drs. Cabanis and Reichenow I was allowed to bring back with me to London a third skin of the same bird, still more lately received, and collected in Angola, at Malange. A comparison of this with our living bird has quite confirmed the opinion I had already arrived at, so that Cabanis's name must yield to Finsch's<sup>2</sup>. The Australian habitat is, of course, a mistake, *Pytelia* being an entirely African form. Of the red-beaked section of *Pytelia*, to which it belongs, *P. wieneri* can only be confused with *P. melba* and its ally (or geographical form) *P. citerior*. The differences between these and the bird under consideration have already been pointed out by Drs. Finsch and Cabanis in their descriptions; suffice it to say that *P. wieneri* is at once, *inter alia*, distinguished from these by its very different markings below, and also by the red of the chin and throat being separated from the greenish-yellow of the lower parts by the interposition of a grey band. In our living bird the beak is bright red and the feet pink; the irides are dark red.

5. Note on a Specimen of Denham's Bustard (*Eupodotis denhami*). By W. A. FORBES, B.A., F.L.S., Prosector to the Society.

[Received June 2, 1880.]

The interest attached to the existence, or otherwise, of special mechanisms connected with the habit of "showing off" in the males of the Otididæ, together with the fact of the subject of the present note being of a species rarely seen in captivity, so that some time may elapse before a further opportunity of examination offers itself, must be my excuse for this short and imperfect notice.

On March 20, 1872, two specimens of *Eupodotis denhami*, from W. Africa, I believe, the first and only ones of this species possessed by the Society, were presented by Governor Uzsher and C. D. O'Connor, Esq. Of these one lived in good health in the Gardens for many years, dying on May 12 last, after having been attacked by a companion hen of *Otis tarda* that was in the same enclosure with it. Having never observed any signs of "showing off" in this bird, I had always considered it to be a female. This surmise, however, proved incorrect, for on dissection it turned out to be a male.

<sup>1</sup> This description is reproduced in the J. f. O. 1878, p. 101. I may here remark that, in my opinion, *Pytelia*, though perhaps a "nonsense name," is sufficiently "like Latin" to be retained, and not replaced by "*Zonogastris*," or altered into "*Pytilia*," as proposed by Dr. Cabanis (*l. c.* p. 100).

<sup>2</sup> I also found a single specimen of this bird, with no precise locality, in the Museum at Hamburg.

On examining the mouth there was no trace of any sublingual or gular pouch; on the contrary, the *frænum linguae* was well developed in its ordinary position. But the *œsophagus*, for the greater part of its course in the neck, though stopping short considerably of its entrance into the thoracic cavity, was much dilated, so that by blowing it up with a blowpipe a large distention of the neck took place, confined, however, to the upper two thirds, or thereabouts, of the neck—the *œsophagus*, which, as usual in the *Otididæ*, develops no crop, being in the rest of its course, till it entered the stomach, of very much smaller calibre.

On inquiring of Mr. Bartlett and the keeper, J. Church, whether they had ever witnessed any display on the part of this bird, they both told me that during the last two summers (1878, 1879) it had "shown off." But this display did not take place in the same way as in *E. australis*, as depicted and described by Dr. Murie (P. Z. S. 1868, pp. 474, 475, pl. xxxvi.); for there was none of that downward distention of the *œsophagus*, and consequent trailing of it on the ground, that is so marked a feature in the showing-off of that species; on the contrary, the distention of the *œsophagus* during display in *E. denhami* is lateral, the neck being immensely puffed out on both sides in a globular way, and so resembling when seen from in front, to use Mr. Bartlett's words, "a lady's muff." In *E. australis*, it must be remembered, there is a similar dilatation of the *œsophagus*, extending, however, in that species, over a larger extent of its course, so that "before dissection, by filling its cavity with air, the lower portion of the dilated *œsophagus* protruded downwards considerably in front of the *symphysis furculæ*, and formed the depending portion of the sac which was so conspicuous in the living animal" (Garrod, P. Z. S. 1874, p. 473).

## 6. Descriptions of twelve new Species of Shells.

By EDGAR A. SMITH.

[Received June 16, 1880.]

(Plate XLVIII.)

Of the species here described, all, with the exception of the *Trophon* and the *Helix*, are in the British Museum; the latter are in the collection of Dr. J. Percy, F.R.S.

### CONUS CONSANGUINEUS. (Plate XLVIII. fig. 1.)

*Testa solida, subponderosa, alba, dilute fusco zonata, epidermide crassa dense lamellosa induta. Spira breviter conica, ad apicem pallide rosea. Anfractus circiter 10, declives, sutura irregulari discreti. Anfr. ultimus superne rotunde angulatus, deinde leviter convexus, in medio levissime constrictus, transversim undulatum rugose striatus, versus basin oblique sulcatus, interstitiis inter*

*sulcos elevatis conspicuis. Inflatio basalis nulla. Labrum tenue, superne et inferne arcuatum, in medio rectiusculum. Sinus sub-suturalis latus, profundus. Apertura alba, supra et infra sub-aequaliter lata.*

Long. 88 mill., diam. 49.

*Hab.* —? (From Mr. Lombe Taylor's collection.)

The outlines of the spire are straight, converging to an acute apex. The upper part of the whorls has been attacked by a boring annelid to such an extent as to destroy almost entirely whatever sculpture may have existed. As far as can be traced, there appear to have been one or two small spiral grooves, fine striæ in the same direction, and flexuous lines of growth. The shallow grooves give the whorls a somewhat concave aspect. The light-brown bands are not well defined; the uppermost is very broad, and falls just above the middle of the whorl; at this point there is a white zone, beneath which are two ill-defined and somewhat confluent bands. The portion of the volution above the uppermost zone is in some places also suffused with light brown. *C. fulvocinctus*, Crosse, is the nearest ally of this species. In form it is not so attenuated at the base, the spire is less elevated, and its epidermis is described as rather thin, whilst that of *C. consanguineus* is very thick and firmly attached; the latter, too, has a rosy apex and more of the light fulvous transverse banding.

#### CONUS NEPTUNOIDES. (Plate XLVIII. fig. 2.)

*Testa conica, roseo-albida, lineis fuscis irregulariter reticulata, paululum supra pauloque infra medium fascia lata, interrupta indistincta ejusdem coloris cincta. Spira elevata, concava, gradata, lineis contortis fuscis radiatim picta. Anfractus circiter 10, superne declives, leviter excavati, striis tribus spiraliter sculpti incrementique lineis arcuatis striati, inferne angulati. Anfr. ultimus superne rotunde angulatus, infra angulum aliquanto convexus, deinde rectiusculus, transversim tenuiter striatus, infra medium sulcis angustis remotis 10–12 oblique sculptus, ad basin supra columellam oblique inflatus. Apertura mediocriter lata, inferne aliquanto latior, intus dilute rosacea. Labrum obliquum, superne infra sinum haud profundum leviter arcuatum, in medio rectiusculum. Columella infra inflationem anfractus rectiuscula, callosa.*

Long. 45 mill., diam. 20.

*Hab.* Australia. (From Mr. Lombe Taylor's collection.)

The pattern upon this shell consists of an irregular network of brown lines, more or less disconnected. This reticulation becomes rather coarser and blotched with brown both above and below the middle of the last whorl, thus forming two broad, but ill-defined bands. This species is allied to *C. neptunus*, Reeve, but rather broader, and has fewer striæ upon the spire. The oblique linear sulci extend only about halfway up the body-whorl, whilst in *C. neptunus* they are observable to the top. The painting, too, is rather different.

**CONUS TAYLORIANUS.** (Plate XLVIII. fig. 3.)

*Testa parva, breviter conica, saturate fusca, albo maculata. Spira breviuscula, gradata, ad apicem prominula, albo variegata. Anfractus 9, superne declives, angulati, ad angulum coronati, striis spiralibus paucis sculpti. Anfr. ultimus superne coronatus et angulatus, infra angulum levissime convexus; spiraliter puncto-striatus, ad angulum maculis magnis remotis niveis et paululum infra medium maculis ejusdem coloris ornatus, et prope basin niveo punctatus. Apertura angusta, fusco-violacea, albo maculata. Labrum superne vix emarginatum.*

Long. 20 mill., diam. 11.

*Hab.* Australia?

The contrast of the white blotches upon the dark-brown ground is very conspicuous. This feature, together with that of the transverse deeply punctured striæ, easily distinguish this interesting shell. It formed part of the collection of Mr. Lombe Taylor, and was purchased with the above locality attached to it.

**CONUS ALBOSPIRA.** (Plate XLVIII. fig. 4.)

*Testa breviter conica, alba, zonis duabus vel tribus strigarum pallide olivaceo-fuscarum picta. Spira concava, mediocriter elevata, ad apicem dilute carnea. Anfractus 9-10, declives, plani, vix gradati, liris tenuibus tribus spiralibus incrementique lineis sculpti. Anfr. ultimus superne subacute angulatus, ad latera leviter convexus, striis transversis supra medium tenuissimis sed inferne profundioribus et subpunctatis insculpti. Apertura supra angusta, versus basin latior, dilutissime lilaceo-alba. Labrum ad angulum vix emarginatum.*

Long. 27·5 mill., diam. 14·5.

*Hab.* —?

This is an unattractive little shell, without any marked characters. The spire is pure white, with the exception of the first five whorls forming the apex, which is of a pale fleshy tint. The whorls are slopingly flattened, and are ornamented with three equal fine liræ, exclusive of the upper raised margin, which might by some be considered a fourth. They are but very slightly raised one above the other, and consequently the spire presents but a very feebly gradated aspect. The painting consists of pale olive stripes, interrupted in such a manner as to form three transverse series of elongate spots, whereof the uppermost are the smallest and situated just beneath the angle, the next just above the middle of the whorl, and the third rather below it. The striæ or sulci on the lower half are crossed by lines of growth, and thus present a somewhat punctured appearance. *Conus straturatus*, Sowerby, somewhat resembles this species; it is, however, a little longer, more strongly sulcated, differently coloured, and has a spotted spire.

**TEREBRA MARIÆ.** (Plate XLVIII. fig. 5.)

*Testa elongata, subulata, fusco-albida, rufo-fusco variegata. Anfractus 20, planati, superne seriebus tuberculorum duabus ornati,*

*spiraliter striati, inferne tenuiter costati. Anfr. ultimus infra medium contractus, in medio zona alba. Columella plica sub-tuberculiformi superne instructa.*

Long. 45 mill., lat. 7.

*Hab.* Japan (*Mr. Maries*).

The nodules of the upper row are larger and much more conspicuous than those of the lower; the latter are oblique and separated from those above by an impressed line. The costæ are not much elevated, a little arcuate, and correspond in number (about 20 on a whorl) and position with the tubercles. The lower half of the volutions, or that occupied by the ribs, is spirally striated, the striæ being continuous over the costæ, and not equidistant. The interstices between the nodules also show indications of spiral lines. The reddish-brown variegation takes the form of longitudinal oblong blotches, which are further apart upon the upper volutions than upon the lower ones. The upper series of granules is comparatively free from brown maculations. The costæ upon the last whorl extend to the base, where they become obsolete. The columella is covered with a callosity, and towards the upper part exhibits a prominent plica.

I take this opportunity of changing the name of a species described by me in the 'Annals and Magazine of Natural History,' ser. 4, vol. xi. p. 267 (1873), as *Myurella belcheri*, as that name had already been employed by Philippi for another species. In its stead I now propose *guayaquilensis*, as the type specimen was collected by Sir Edward Belcher at Guayaquil, in Ecuador.

**TROPHON STUARTI.** (Plate XLVIII. fig. 6.)

*Testa breviter fusiformis, alba. Anfractus 7, superne planati et angulati lateribus planis, costis late lamelliformibus, aliquanto obliquis, erectis, superne ad angulum valde sursum productis dextrorsumque curvatis, costis transversis (in anfr. superioribus 2-3, in ultimo 4) æquidistantibus, et supra longitudinalibus continuis instructi. Apertura irregulariter ovata, inferne in canalem producta. Canalis curvatus, retrorsus, aperturam fere æquans. Columella leviter arcuata, callo tenui extus libero induta. Labrum expansum, costa ultima lamelliformi extus munitum.*

Long. 53 mill., diam. 21. Aperturæ (cum canali) long. 31, lat. intus 10.

*Hab.* Vancouver's Island (*Cutter*).

This is a pure white shell, remarkable on account of the thin lamellæ which adorn it. At the upper part, at the angle of the whorls, these are much prolonged upwards, hollow on one side, ridged on the other, and curved to the right. Of the spiral liræ, that at the angle is rather stouter than the rest. Upon the upper whorls they are proportionally more elevated than upon the last, and, with the longitudinal lamellæ, form a coarse reticulation. Upon the body-whorl, towards the lower part, they cease to be erect, are lapped one upon another, and form an imbricated caudal ridge subparallel with the canal. The entire surface is both spirally and



longitudinally minutely striated, a feature observable only under a lens. The specimen described is in the collection of Dr. J. Percy, F.R.S.

**LATIRUS NAGASAKIENSIS.** (Plate XLVIII. fig. 7.)

*Testa crassa, fusiformis, rotunde plicata et spiraliter lirata, costis nigro-fuscis, interstitiis pallide rufis, liris pallidioribus vel albidis. Anfractus circiter 12, convexiusculi, sutura profunda undulata sejuncti, costis vel plicis 8 latis, rotundatis, paulo obliquis, supra spiram subregulariter continuis instructi, liris transversis supra costas prominulis (in anfr. superioribus 3, in ultimo circiter 12) et lineis elevatis fliformibus interjacentibus cincti. Anfr. ultimus superne rotundatus, infra medium contractus, ad basin anguste perforatus, costis inferne attenuatis subobsoletis. Apertura fusco-albida, cum canali longitudinis totius  $\frac{3}{4}$  adæquans, intus tenuiter lirata. Columella callo fusco-albido induta, superne parum arcuata, ad basin obliqua, in medio plicis tenuibus tribus levissime elevatis instructa. Canalis obliquus, vix reflexus.*

Long. 60 mill., lat. 22.

*Hab.* Japan (Mr. Maries).

This species may readily be distinguished by its striking painting. The swollen plicæ, which are about twice as broad as the interstices, are of a rich chocolate-brown, whilst the interlying spaces are quite pale. *L. varicosus* is somewhat similarly coloured, but is less robust, the plicæ being narrower and the spiral liræ more numerous. *L. craticulatus* is more cylindrical, has less pronounced costæ, coarser spiral ridges, and is differently coloured. One specimen has a distinct transverse tubercle at the upper part of the columella, but in the other it is less developed.

**CYPREA DECIPIENS.** (Plate XLVIII. figs. 8, 8a.)

*Testa ovata, antice angustata, alta, in dorso gibbosa, inferne fere plana, superne pallide olivaceo-fusca, maculis irregularibus valde saturatioribus guttata et variegata, versus basin colore aurantiaco-rubro suffusa, infra eodem colore picta. Apertura angusta, intus alba. Anfractus ultimus intra aperturam omnino niveus. Dentes labri circiter 20, mediocriter validi, columellares minus distincti, anteriores quinque vel sex cæteris magis producti. Sulcus columellaris antice latus, haud profundus.*

Long. 52 mill., diam. 36, alt. 32.

*Hab.* North Australia (Mr. Jamrach).

At a first glance this shell, unfortunately in a worn state, might very naturally be considered a dwarfed and peculiarly coloured variety of *C. thersites*; and it is impossible to affirm with certainty that such may not really be the case. Certain distinctions, however, present themselves, which, if constant, would certainly entitle this form to specific rank. In the first place, it is considerably smaller than any examples of *C. thersites* I have seen; nor has Mr. G. B. Sowerby, jun., who is thoroughly acquainted with the variation of the species of this genus, ever had one of such small dimensions come under

his notice; he informs me, too, that, as far as his knowledge of this species extends, it exhibits but comparatively slight variation in point of size. Secondly, the form is not quite the same, the back being higher and more humped. But the chief differences are met with at the base. This part is certainly flatter than in any individual of *C. thersites* I have been able to compare, of a rich orange-red colour, which also extends up about one third of the sides of the shell. On the contrary, *C. thersites* is white upon both sides of the aperture, blotched and stained with black-brown towards the circumference of the base. The teeth on the outer lip are white, and almost always faintly streaked with brown above, the streak becoming broader and more intense in colour towards the margin; they are also rather more numerous, and not bent over so deeply as in the present species, consequently the labrum is not so thick. Another distinctive feature consists in the body-whorl within the aperture being pure white; in *C. thersites*, judging from the series of specimens I have examined, it is invariably partially uncoated with callus, and of a brown mottled appearance. The aperture of *C. thersites* at the posterior end curves very much to the left; in the present form the curvature is very slight. Finally, the geographical distribution of *C. thersites*, according to Mr. Angus (P. Z. S. 1865, p. 170), "is very limited, the above-named locality (Salt Creek, Yorke's Peninsula, S. Australia) being the only place where it has hitherto been met with." On the contrary, the shell here described is North-Australian according to the statement of Mr. Jamrach, from whom it was purchased for the Museum. Presuming this to be correct, the probability of its specific distinctness becomes almost a certainty.

**TURBO (POMAULEX?) TAYLORIANUS.** (Plate XLVIII. fig. 9.)

*Testa turbinato-conica, infra plana, imperforata, purpureo-rosea, strigis obscurioribus perobliquis indistincte notata, ad basin albida. Spira breviter conica, marginibus rectiusculis. Anfractus circiter 8, declives, superne levissime concavi, inferne convexiusculi, ad suturam carina rugosa subsquamosa ornati, liris numerosis granulorum subæqualium parvorum cincti. Anfr. ultimus infra medium acute carinatus, supra carinam leviter excavatus, infra eam planus. Basis albida, zona externa purpureo-rosea cincta, seriebus concentricis granulorum ornata, in regione umbilicali callo albo lævi flavo-marginato induta. Columella albo-callosa, arcuata.*

Alt. 40 mill., diam. max. 49.

*Hab.* —? (From Mr. Lombe Taylor's collection.)

This species is remarkable on account of its flattened base and the contrast of colour of the upper and lower surfaces. The granular series are about eleven in number on the penultimate whorl, rather more numerous upon the upper part of the last, upon the base of which they number about sixteen, whereof four or five nearest the circumference are of the same colour as the upper part of the shell, the rest being nearly white. The entire upper surface between the

granules is finely, irregularly, and somewhat obliquely striated; and the base exhibits intermediate concentric striæ between the rows of granules. The carina, visible upon the body-whorl, winds up the spire just above the sutural line, and upon the upper whorls especially is furnished with numerous, somewhat tubulous short spines, which, lying upon the volution beneath, give to the sutural line a festooned appearance. No locality, unfortunately, is attached to this shell, but it is probable that it is a Chinese or Japanese form.

*LIOTIA CRASSIBASIS.* (Plate XLVIII. fig. 10.)

*Testa solida, umbilicata, alba. Spira brevis, ad apicem depressa. Anfractus 4, superne plani, via declives, deinde angulati, carinis duabus (quarum superior ad angulum sita) et plicis tenuibus supra carinas acute subnodosis clathrati, lirisque tenuibus supra angulum circiter quatuor, infra eum duabus cincti, incrementi lineis elevatis ormati. Anfr. ultimus plicis versus labrum longe majoribus superneque haud planatis, infra carinam inferiorem late constrictus, liris pluribus granulatis concinne ornatus, ad basin circa umbilicum porca convexa, versus aperturam latissima, spiraliter et longitudinaliter obsolete lirata instructus. Apertura circularis, margine basali crassissimo, intus pallide fusco-margaritacea.*

Long. 12 mill., diam. 14.

Operculum extus seriebus concentricis granulorum calcareorum ornatum.

*Hab.* — ?

This is a remarkably sculptured shell and very peculiar in form. The upper whorls and half the last one are flattened at the top, and scarcely slope at all. The last half of the body-whorl, however, upon which the plicæ become very much larger than those above, is a little convex. The lines of growth are elevated, excessively close together, and cover the entire surface of the shell, being continuous upon the keels and liræ and in the interstices between them. The plicæ are somewhat acuminate produced upon the upper carina, which, when viewed from above, presents a prettily festooned appearance. The immense thickening at the base of the body-whorl is very remarkable, and forms an excessively thick base to the aperture. Between this thickening and the lower keel the whorl is a little constricted or concave, especially so towards the mouth; and in this part the transverse liræ, about twelve in number, are finely granulose. The plicæ do not extend below the keels, nor do they interrupt the spiral liræ, the latter being continuous on and between them.

*PALUDINA SPEKEI.* (Plate XLVIII. fig. 11.)

*Testa pyramidalis-ovata, late umbilicata, sub epidermide olivacea albida, versus apicem lilaceo-fusca. Anfractus 6, superne sub-humerosi, ad latera parum convexi, spiraliter minutissime striati lineisque elevatis paucis subæquidistantibus subgranosis cincti.*

*Spira subgradata*, pallide lilacea. Anfr. ultimus ad peripheriam rotundatus, usque ad basin lineis subgranosis ornatus. Apertura late ovata, superne aliquanto acuminata, intus cæruleo-alba, versus labrum olivacea, longitudinis totius  $\frac{1}{2}$  haud æquans. Peristoma nigrescens, marginibus callo saturate olivaceo junctis.

Long. 34 mill., diam. 23; aperturæ long. 16, diam. 12.

Hab. "Low land near the east coast of Africa, from 6° to 7° south latitude" (Capt. J. B. Speke).

This interesting species is well characterized by its deep and wide umbilicus, and the peculiar elevated transverse subgranular lines encircling the whorls. They are about ten in number on the penultimate volution and about thirty on the last. The epidermis is of a greenish-olive tint, and is varied at intervals by darker concentric stripes, which probably indicate stages of arrested growth.

HELIX (AMPELITA) PERCYANA. (Plate XLVIII. figs. 12, 12a.)

*Testa tenuiuscula, depresso-globosa, mediocriter umbilicata, undique minute subseriatim granulata incrementique lineis perobliquis sculpta, fusco-olivacea, opaco-lacteo sparsim fulgurata. Anfractus 4, celeriter accrescentes, convexi; ultimus magnus, aliquanto inflatus, antice descendens. Spira prominula, ad apicem obtusata. Apertura magna, transversa, parum obliqua, fere subhorizontalis, intus lilacea. Peristoma album, breviter expansum et reflexum, marginibus approximatis, columellari obliquo, rectiusculo, vix arcuato.*

Diam. max. 31 mill., min.  $22\frac{1}{2}$ , alt. 18.

Hab. Madagascar. (In Dr. J. Percy's collection.)

The ornamentation of this pretty species is very peculiar. The narrow zigzag lines are irregular in their disposition, and of the same opaque creamy colour as frequently adorns many of the species of *Orthostylus* from the Philippine Islands. The granules which cover the entire surface are disposed in somewhat irregular closely-set transverse series, interrupted considerably by oblique lines of growth. The texture of the shell is thin, and so transparent that the fulgurations of the exterior are quite conspicuous through the lilac interior of the aperture.

#### EXPLANATION OF PLATE XLVIII.

- g. 1. *Conus consanguineus*, p. 478.
2. — *neptunoides*, p. 479.
3. — *taylorianus*, p. 480.
4. — *albospira*, p. 480.
5. *Terebra mariesi*, p. 480.
6. *Trophon stuarti*, p. 481.
7. *Latirus nagasakiensis*, p. 482.

Fig. 8, 8a. *Cypræa decipiens*, p. 482.

9. *Turbo* (*Pomaulax*?) *taylorianus*, p. 483.

10. *Liotia crassilaxis*, p. 484.

11. *Paludina spekei*, p. 484.

12, 12a. *Helix* (*Ampelita*) *percyana*, p. 485.

7. Notes on the Indian Bustard (*Eupodotis edwardsi*), with especial reference to its Gular Pouch. By Sir WALTER ELLIOT, K.C.S.I., F.R.S., F.Z.S.

[Received June 7, 1880.]

When looking through some of the Society's 'Proceedings,' my attention was drawn to a paper by Dr. Murie, in the volume of 1868 (p. 471), on the occurrence of a gular pouch in certain species of Otididæ, and on the probable use of such an organ, which, with reference to observations made by him on an individual of *Otis australis*, he considers to be "a subject calling for more extended examination in other members of the family." In this view, the following notice of the habits of the Indian species (*Eupodotis edwardsi*) may not be without interest.

This Bustard is found in considerable numbers on the open basaltic plains of the Dekhan, where I had many opportunities of observing it during a residence of several years in that part of India. So common was it that the late Colonel Robert Mansfield, commanding the Poonah Irregular Horse quartered at Seroor between Ahmadnagar and Poona, had killed several hundreds when I saw him in 1829, and he was trying to make up his bag to 1000 birds, a feat which he accomplished some three or four years afterwards, and which, when the shy and wary character of the Bustard is considered, was thought to be a remarkable incident of sportsmanship.

I had often remarked the gular pouch with which the male is furnished, and communicated some notes I had made on the subject to the late Dr. Jerdon, who quoted them in his first Catalogue of the Birds of India, published in the Madras Journal of Literature and Science<sup>1</sup>.

On the occasion there referred to, I was riding across an undulating plain near the village of Scindaghi, in the Sholapur district, on the morning of the 12th Oct. 1829, when I was attracted by a distant sound as of a person moaning. Thinking it proceeded from some one in pain, I turned towards the spot from which it came, and after riding upwards of a mile, during which the noise became louder and more distinct, I saw a large cock Bustard strutting about on a rising ground with gesticulations so extraordinary that I stopped to watch him. He paced round and round, ruffling his plumage, with wings sweeping the ground, tail erect, neck distended, the feathers standing out like a ruff, whilst he uttered the cry that had drawn me to the spot, every now and again rushing forward a few paces, then wheeling round, and pirouetting back again. I dared not approach very near, fearing the suspicious disposition of the bird, who would have made off as soon as he saw me; but I watched him, whilst, to use Mr. Bartlett's phrase, he was thus "showing off," evidently for the purpose of attracting the hens, several of whom were seen flying towards him.

<sup>1</sup> Vol. xii. p. 8, 1839-40, and in the Collected Vol. p. 147.

Whilst so engaged I heard the same sounds coming from another cock at a greater distance and many birds (generally so solitary and living so far apart) were seen on the wing; and afterwards I often heard the call at the same season, about the beginning of the cold weather (October to December).

On one occasion, somewhat later, in a different part of the country, south of the Kistna, in the month of February, I raised a hen sitting on her nest, which was a very simple affair, consisting of a little dry grass lying on the ground among some low bushes; in it were two eggs which I carried away and brought home in 1834. They met with rough usage during my second absence in India: one was broken to pieces, and the other much damaged, but my daughter has put it together and it is here on the table. These were of an olive-green colour, spotted and blotched with brown. Probably the hen lays more eggs, for I have seen three and even four well-grown young birds feeding together in company with the old one. They shift their ground according to the season, frequenting the high grassy downs (or *máls*) during the rainy and cold weather, then coming down towards the cultivation, and in the dry season drawing towards the neighbourhood of streams and rivers. Their food consists of insects, berries, grain, &c. In the cold season the crops of those I examined contained *Grylli*, beetles of all kinds (Cetoniidæ, Elateridæ, Buprestidæ, Carabidæ), frequently the spongy nidus of the mantis, caterpillars, Julidæ, Scolopendridæ, &c., and on one occasion I found an unbroken egg of a Quail (*Coturnix textilis*); with these were seeds, berries of low-growing shrubs, stones and gravel. On the cultivated land they devour quantities of the wild gourd (the *kunker* of the natives), so abundant on the black cotton soil; and when the crops ripen they have recourse to the various kinds of millet, bolting the whole head often entire, and to the many sorts of pulse cultivated as a second crop. Thus it appears few things come amiss to them.

Their flight is slow, and heavy, with a regular motion of the wings. When suddenly disturbed they utter a hoarse note, something like *kok kok*, and fly far, but otherwise they are silent except at the breeding-season. I have heard of instances in which they have been ridden down by a well-mounted horseman where there was space enough<sup>1</sup>. Falconers sometimes try to kill them with the Peregrine; but I always found that the *Bhyree* was no match for the Bustard, which lighted as soon as the Falcon stooped and attacked it so courageously that it would not repeat the assault. So rarely has the pursuit been successful that the Nawab of Banganapilly in Cuddapah conferred a village Inam (or free tenure) on a falconer who achieved the feat.

These Bustards vary greatly in size, the hens weighing from 10 to 20 lbs., the cocks from 25 to 35 lbs. Col. Mansfield has got them as high as 40 lbs. I examined the gular pouch of a cock which weighed 32 lbs.; and, to gauge its capacity, secured it with a ligature at the bottom and filled it with water from the gape by means of a common

<sup>1</sup> In the 'Bengal Sporting Magazine' for 1857 there is an account of this having been accomplished by a party of officers at Loodianah.

pint bottle; it held the contents of seven with ease. I thought at one time this organ might be intended to enable the bird to carry a supply of water in the hot season when every thing is dried up; but considering the solitary habits of the bird, and that the male alone is furnished with such an appendage, I incline to Dr. Murie's opinion that it is an organ of sound to attract the females in the breeding-season.

The following were the measurements of an average-sized male bird weighing 25 lbs.:—

	inches.
Length from point of beak to end of tail . . . . .	48
Height, standing . . . . .	41
Length of leg . . . . .	22
„ „ tarsus . . . . .	8½
Expansion of wings . . . . .	7 ft. 7

As may be supposed, so remarkable a bird, so widely distributed, has many native names. It is the "*tokdar*" of the Mahomedan falconers; "*tughderi*" in Turkish; "*yére-laddu*" of the Canarese; "*batta mékha*" of the Yanadis or nomade bird-catchers; "*gunad*" of the Pardis or northern bird-catchers. In Rajputana, Gwalior, and Bundelkund it goes by the name of "*hukna*," from its note on being frightened, which the villagers compare to the sound "*huk, huk*." In Sagar they are called "*bherar*."

A well-known contributor to the 'Bengal Sporting Magazine,' under the *nom de plume* of "*Gunga*" (Dr. Brown), says that "during the breeding-season the cock calls like a lion—a kind of booming growl, whence its native local name of *gooraeen*" (*gurayin*)<sup>1</sup>. In other parts, he adds, "it is called *gugunbher*<sup>2</sup> and *sohun*."

P.S.—Since the foregoing was read, I have read Prof. Newton's paper in the 'Ibis' (vol. iv. p. 107, 1862), in which, with reference to some disparaging remarks of a continental writer on the statements of certain English naturalists, he gives an exhaustive summary of all that has been recorded on the subject of this peculiar structure of the Bustard. From this it appears that its true nature is still involved in doubt.

The occurrence of a gular pouch in the male of *Otis tarda* was first discovered, but not published, by Dr. James Douglas, F.R.C.P., before 1740. It is fully described by Edwards (Nat. Hist. B. ii. tab. 73); and this view seems to have been accepted till 1848, when Prof. Owen, in making a preparation of the head and neck of a male bird for the Mus. Coll. of Surgeons, stated that there was "no trace of a gular pouch." In 1853 Mr. Yarrell contributed a paper to the Linn. Trans. (vol. xxi. p. 159), in which he comes to the same conclusion. He was followed by Mr. Newton himself, whose examination failed to detect the existence of a separate distinct pouch with an external opening from above, and left it in doubt whether any

<sup>1</sup> Probably from the Hindustani "*gurgurāra*," to thunder, to roll, to roar like a tiger.

<sup>2</sup> From "*gugan*," the sky, and "*bherna*," to hide = sky-hider.

such organ exists at all, or whether the bird only has the power of greatly distending the integuments lining the trachea at the season of amateness, and of so effecting the appearance exhibited when "showing off."

8. On the Dates of Publication of the Parts of Sir Andrew Smith's 'Illustrations of the Zoology of South Africa.'  
By F. H. WATERHOUSE, A.L.S., Librarian to the Society.

[Received June 12, 1880.]

In the 'Ibis' for 1868, p. 499, the late Mr. G. R. Crotch published the dates of the issue of the various livraisons of Temminck and Laugier's 'Nouveau Recueil de Planches coloriées d'Oiseaux,' which many zoologists have no doubt found of great use when working at synonymy. As there are many other zoological works which have appeared in parts occupying some years in completion, and of which copies in the original wrappers are becoming very scarce, I have thought it might be desirable to record the exact dates of the issue of the parts of one of which my father has possession, namely Sir Andrew Smith's 'Illustrations of the Zoology of South Africa.'

As the copy here alluded to did not contain plates xviii. and xxxviii. (*Mammalia*), I have examined three or four other copies; and as neither of these plates are to be found in any of these, I presume they do not exist.

There are one or two other peculiarities perhaps worth calling attention to—namely, that plate xxxi. (*Reptilia*) was published after plate lxix., and plate xix. (*Pisces*) after plate xxvi.

Part.	Date.	Mammalia Plates.	Aves Plates.	Reptilia Plates.	Pisces Plates.	Inverte- brata Plates.
I.	1838.	1, 2.	1, 2, 3, 4.	1, 2, 3.	1.	1, 2, 3, 4.
II.	1838.	3, 4, 5.	5, 6, 7, 8, 9, 10.	4.	.....	
III.	1838.	.....	.....	.....	.....	
IV.	1838.	6, 7.	11, 12, 13, 14, 15, 16, 17.	5.	.....	
V.	1839.	8, 8 (bis), 9.	18, 19, 20, 21, 22, 23.	.....	2.	
VI.	1839.	10, 11, 12, 13, 14, 15.	24, 25, 26.	6.	.....	
VII.	Sept. 1839.	16, 17.	27, 28, 29, 30, 31, 32.	7.	3.	
VIII.	Nov. 1839.	19.	33, 34, 35, 36, 37, 38, 39.	8.	4.	
IX.	Jan. 1840.	20, 21.	40, 41, 42, 43, 44, 45.	9.	5.	
X.	Mar. 1840.	22, 23, 24, 25.	46, 47, 48, 49, 50.	.....	6.	

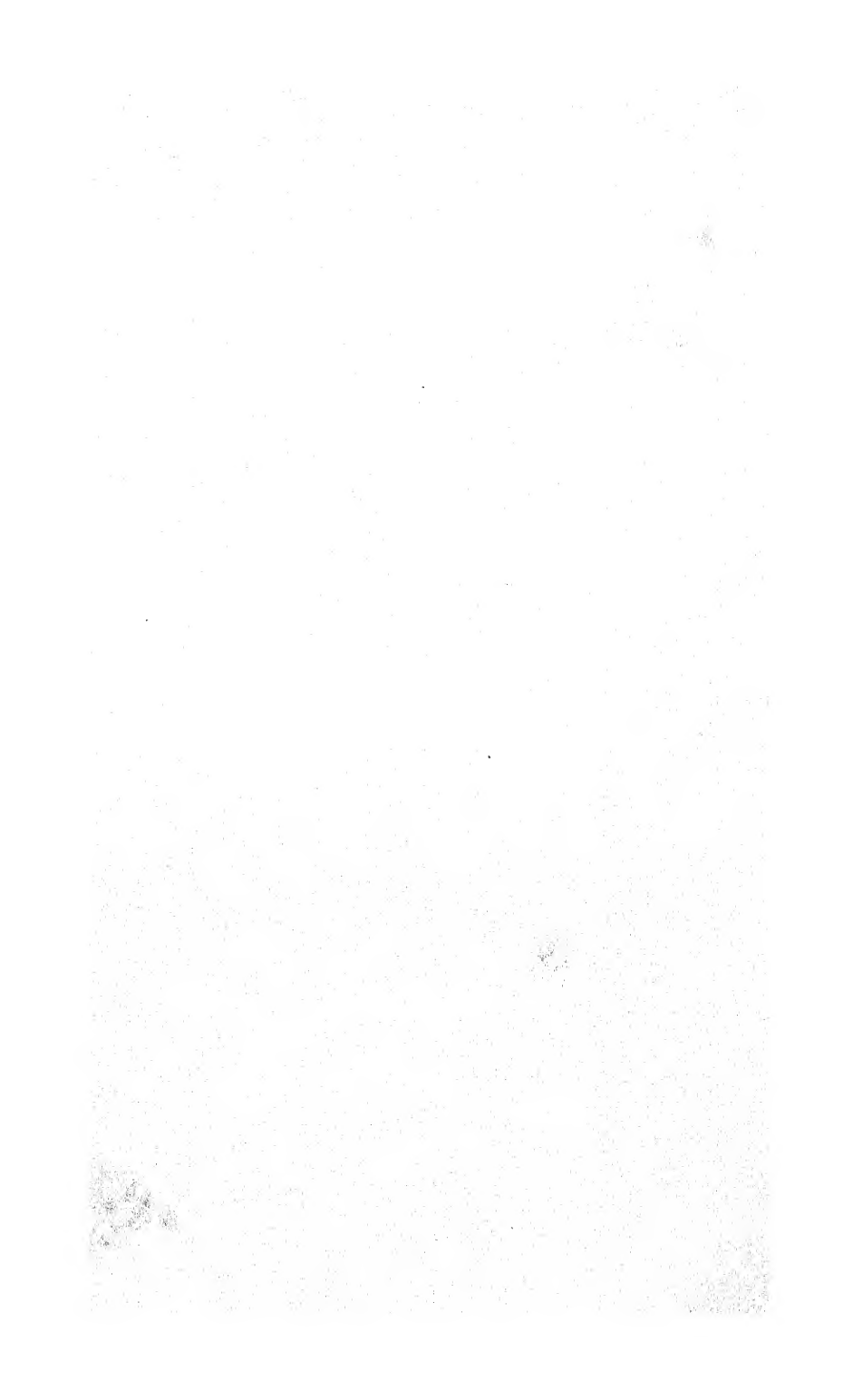


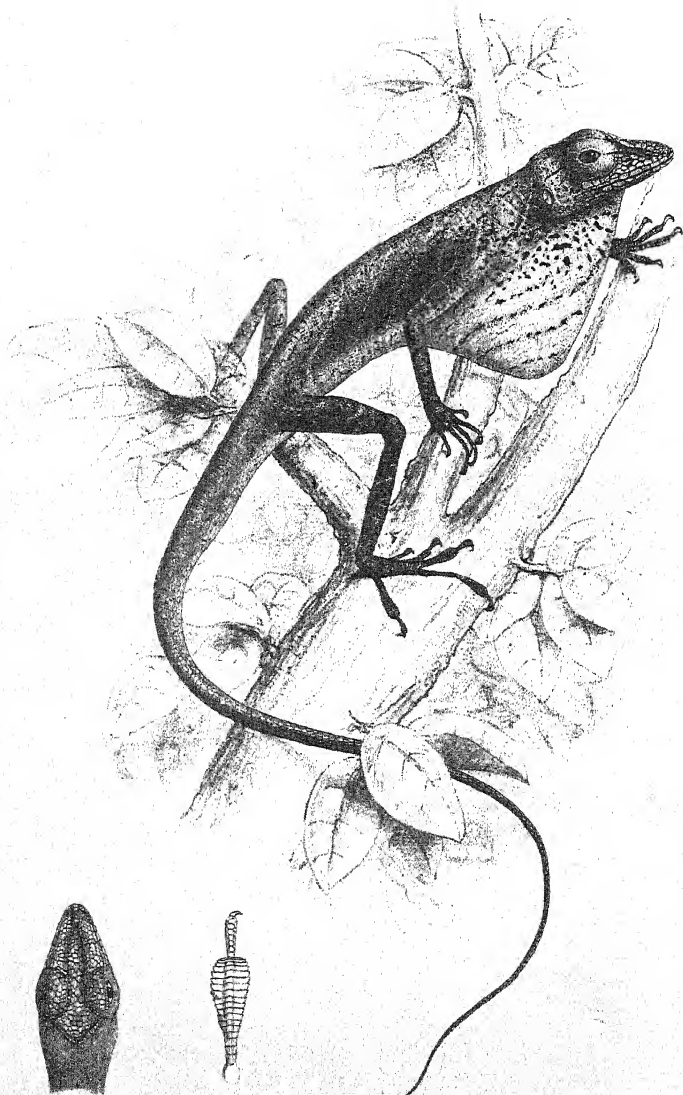
Table (continued).

Part.	Date.	Mammalia Plates.	Aves Plates.	Reptilia Plates.	Pisces Plates.	Inverte- brata Plates.
XI.	July 1840.	26.	51, 52, 53, 54, 55, 56, 57.	.....	7, 8.	
XII.	Oct. 1840.	27, 28, 29, 30.	58, 59, 60, 61, 62, 63.	.....	.....	
XIII.	Jan. 1841.	31, 32.	64, 65, 66.	10, 11, 12, 13.	9.	
XIV.	Sept. 1841.	33, 34.	67, 68, 69.	.....	10, 11, 12, 13, 14.	
XV.	Feb. 1842.	35, 36.	70, 71.	14, 15, 16, 17.	15, 16.	
XVI.	Aug. 1842.	37.	72, 73, 74.	18, 19, 20, 21.	17, 18.	
XVII.	Jan. 1843.	39.	75, 76, 77, 78, 79, 80.	22, 23.	+ 20.	
XVIII.	July 1843.	.....	81, 82, 83, 84, 85, 86.	24, 25, 26, 27, 28, 29, 30.	.....	
XIX.	Nov. 1843.	40, 41.	87, 88, 89, 90, 91.	+ 32, 33, 34.	.....	
XX.	Aug. 1844.	42, 43.	92, 93, 94, 95.	35, 36, 37, 38.	.....	
XXI.	Oct. 1844.	44.	96, 97, 98.	39, 40, 41, 42.	21, 22, 23.	
XXII.	Mar. 1845.	45.	99, 100, 101, 102.	43, 44.	24, 25, 26.	
XXIII.	Oct. 1845.	46.	103, 104, 105.	45, 46, 47, 48, 49.	19†, 27.	
XXIV.	Dec. 1846.	.....	106, 107.	50, 51, 52, 53, 54.	28, 29, 30.	
XXV.	Oct. 1847.	47.	108, 109, 110, 111, 112.	55, 56, 57, 58.	.....	
XXVI.	Dec. 1847.	48, 49, 50.	113.	59, 60, 61, 62, 63.	31.	
XXVII.	July 1848.	51, 52.	114.	64, 65, 66, 67, 68, 69.	.....	
XXVIII.	1849.	.....	.....	31†, 70, 71, 72, 73, 74, 75, 76, 77, 78.	.....	

Sir Andrew Smith's expedition into the interior of S. Africa was performed in the years 1834-36, and in the latter year there was a Report<sup>1</sup> published, for subscribers only, containing a short account of his journey, with an Appendix containing descriptions of many of the new species of Mammals and Birds discovered, namely:—(MAMMALIA) *Galago moholi*, *Ichneumon rattamuchi*, *I. cauii*, *Macroscelides intufi*, *M. brachyrinchus*, *Sorex concolor*, *Mus marikquensis*, *M. coucha*, *M. lehocla*, *Gerbillus pæba*, *G. brantsii*, *Sciurus cepapi*, *Rhinoceros keitloa*. (AVES) *Falco semitorquata*, *Malaconotus similis*, *M. australis*, *Prionops talacoma*, *Merula libonyana*, *M. obscura*, *M. litsitsirupa*, *Crateropus jardinii*, *Bessonornis humeralis*, *Erythropygia*

<sup>1</sup> [Report of the Expedition for Exploring Central Africa from the Cape of Good Hope, June 23, 1834, under the superintendence of Dr. A. Smith. 8vo. Cape Town, 1836.] See also Journ. R. Geogr. Soc. vi. (1836), p. 394.





F. Mintern del et lith.

Mintern Bros imp

ANOLIS BUCKLEYI

*pectoralis*, *E. paena*, *Alauda chuana*, *Mirafra africana*, *M. africanoides*, *M. sabota*, *Certhilauda semitorquata*, *Emberiza tahapisi*, *E. impetuani*, *Zonotrichia africana*, *Megalotis verticalis*, *M. australis*, *Linaria gularis*, *L. atrigularis*, *Estrella lipiniana*, *E. squamifrons*, *Pyrgita motitensis*, *P. diffusa*, *Crithagra selbyi*, *Euplectes tahu*, *Ploceus tahatali*, *Ploceus dubius*, *Plocepasser mahali*, *Loxia lathami*, *Bubalornis niger*, *Megalopterus australis*, *Eurocephalus anguitimens*, *Cinnyris mariguensis*, *C. talatala*, *Chrysophilus bennettii*, *C. abingoni*, *Polysticte quopopa*, *Coliphimus concolor*, *Perdix swainsonii*, *P. levailantoides*, *P. sephaena*, *P. coqui*, *Ortygis lepurana*, *Pterocles variegatus*, *P. gutturalis*, *Otis ruficrista*, *O. afraoides*, *Cancrophagus gutturalis*, *Carbo africanoides*.

9. Description of a new Species of *Anolis*, with Notice of some other Species of that Genus from Ecuador. By A. W. E. O'SHAUGHNESSY, Assistant in the Natural History Departments, British Museum.

[Received June 14, 1880.]

(Plate XLIX.)

In the collection of zoological objects made by Mr. Buckley in Ecuador, which has proved singularly rich in new and remarkable forms among the lizards, I find represented the following species of *Anolis*.

From Canelos :—

*ANOLIS CHRYSOLEPIS*, D. & B. Erp. Gén. iv. p. 94; Guich. in Casteln. Amér. du Sud, pl. 4. f. 1.

The *Anolis scyphus*, Cope, must be considered identical with this species, if we may judge from some specimens in the British Museum to which Mr. Cope some years ago affixed that name.

*ANOLIS NUMMIFER*, O'S., = *vittigerus*, Cope, part.

*ANOLIS PENTAPRION*, Cope, Proc. Ac. Phil. 1862, p. 178.

*ANOLIS NASICUS*, D. & B. l. c. p. 115; Guichen. l. c. pl. 4. fig. 2.

From Pallatanga :—

*ANOLIS CHRYSOLEPIS*, D. & B.

*ANOLIS VIRIDIÆNEUS*, Peters, MB. Ak. Berl. 1863, p. 147.

*ANOLIS BOUVIERI*, Bocourt, Miss. Scient. Mex. iii. p. 58, pl. 14. figs. 8, 8a.

In addition to the above, the same collection contains two specimens of a beautiful *Anolis*, which I have no hesitation in pronouncing a new species, and which I now proceed to describe.

## ANOLIS BUCKLEYI, sp. n. (Plate XLIX.)

Form elongate, slender; muzzle rounded, very convex anteriorly, becoming very concave in front of the orbital region, covered with numerous rounded or polygonal plates, minute between the nostrils, but rather large elsewhere. Three large plates on the facial ridge between the orbit and the nostril. Bony orbital and occipital ridges strongly marked. Plates of the orbital ridge very large, the two series contiguous and not separated by any interorbital row of scales; supraorbital scales large, polygonal. Occipital plates indistinct and sunken, the diamond-shaped space formed by the orbital and occipital ridges being occupied by plates of irregular shape and size. All the head-shields smooth. Three series of elongate loreal scales. Infraorbitals immediately upon the supralabials, which are a series of elongate narrow scales, eight in number, becoming excessively narrow posteriorly, where the deepest of the infraorbitals almost reaches the corner of the mouth.

Mental a very broad and scarcely cleft plate, resembling that of *Anolis nasicus*, but reaching further on either lateral infralabial part of the lower jaw than in that and most other species of *Anolis*, which offer degrees of variation in this particular. In the present species the extent of this plate is very remarkable, the point where it touches the double series of infralabials on each side of the jaw being in a vertical with the hinder edge of the first upper labial. Scales of the chin minute, rounded, becoming granular posteriorly. Gular pouch very large.

The entire upper and lateral surfaces of the body are finely granular, the granulation being more minute than in *Anolis nasicus*. Ventral surface with moderate-sized square or rounded scales, not keeled.

Tail very long and tapering, nearly twice the length of the head and body; granular above, and with larger broad scales beneath. Hind limb stretched forward reaching to the front edge of the ear; fore limbs laid backwards reaching three fourths the length of the side. Digital dilatations well developed, pyriform, with broad transverse plates beneath.

*Coloration* (in spirits). Ground-colour brownish or greenish, with black spots or punctulations on the back and sides, and a black network on the upper surface of the head round the edges of the scales. The black spots are very conspicuous on the sides and along the origin of the gular pouch. The pouch is very large, of a bright saffron-yellow, with black longitudinal streaks and spots at the base. A black streak along the loreal space to the eye. Fine oblique white or bluish stripes down the sides of the body, with rows of black dots between. Ventral surface pale bluish, dotted with black.

millims.

Length from tip of snout to extremity of tail . . . . .	250
Length of head to anterior border of ear-opening . . . . .	21
Width of head posteriorly . . . . .	11
Length of the body from the ear-opening to the anus . . . .	67

	millims.
Length of the tail .....	163
Length of the femur .....	19
Length of the tibia .....	20

*Hab.* Ecuador. The two adult specimens on which the above description is founded were obtained from Mr. Buckley, and are in the British-Museum collection.

This species presents a striking similarity in appearance to *Anolis* (*Rhinosaurus*) *nasicus*, the forms and proportions being the same. The points of distinction between them are, however, numerous; the rostral and mental shields are quite different, the latter plate being much shorter on each side in *A. nasicus*, in which also the head-shields show a different arrangement, and the supraorbital semicircles of plates are not in contact on the space between the eye.

# 10. Field-notes on the Morroop (*Casaurius bennetti*) of New Britain. By WILFRED POWELL.

[Received June 15, 1880.]

The interior of the northern peninsula of New Britain is composed of high tableland and grassy plains of considerable area. It is on these plains that the Cassowary of this island (*Casaurius bennetti*) is mostly to be found. These birds are generally seen moving slowly along in the high grass, with their heads just showing above it. The plains appear to be their feeding-ground, as they are rarely seen in the bush during the daytime. They are gregarious in their habits, travelling in flocks of three or four; I have sometimes seen as many as seven in a flock together. When in motion they always go in Indian file, with the cock bird leading. They do not seem to advance over the ground very quickly unless alarmed, when they travel with marvellous rapidity, having a bounding motion, which is not, in my estimation, very graceful. When they select a place for their nests, they do so usually in an open glade that is well timbered, but without underscrub. Here they scrape the earth together into a slight heap with a depression in the centre. The nest is circular in form, about five feet in diameter, the outside being raised about six inches from the ground-level. Here they lay their eggs, which are left to hatch by the heat of the sun. The natives who search for these nests, in order to obtain the eggs for food (which they consider a great delicacy, though I cannot say I like them myself, their flavour being too strong), assure me that they seldom find more than three at a time in one nest, and that when the bird has laid one egg, it leaves the nest for some days before returning to lay another; whether they lay eggs elsewhere, in the meanwhile, I cannot say. The egg is about five inches long by three inches wide at the broadest part, and is thickly mottled with delicate light green spots.

The Cassowary's food consists of lizards, frogs, fruit, nuts, and

they are also very fond of fish. Whilst in conversation with a native one day, he told me that the Pook-Pook (or Crocodile) was very fond of Cassowary's flesh and often eats them. It puzzled me very much to understand how it was that the alligator, who is so unwieldy in his movements on shore, could possibly catch a bird of such swiftness. It chanced that afterwards I witnessed an interesting occurrence that may very possibly account for it. I was one day some little distance up a river in New Britain, sitting in my little dingey fishing (the boat and myself being partially hidden by bushes); I saw a Morroop (Cassowary) come down to the water's edge and stand for some minutes apparently watching the water carefully; it then stepped into the river where the water was about three feet deep, and partially squatting down, spread its wings out, submerging them, the feathers being spread and ruffled. The bird remained perfectly motionless; I also noticed that the eyes were closed as if asleep. It remained in this position for fully a quarter of an hour, when suddenly closing its wings and straightening its feathers, it stepped out onto the bank, where, shaking itself several times, a number of small fishes fell from under the wings and from amidst the feathers, which were immediately picked up and swallowed. The fishes had evidently mistaken the feathers for a description of weed that grows in the water along the banks of the rivers in this island, and very much resembles the feathers of the Cassowary, and in which the smaller fish hide to avoid the larger ones that prey on them. I think it would have been very easy for an alligator to seize the bird whilst thus in the water. These birds generally go into the thickest scrubs to sleep; and although I have never myself seen them, I hear from the natives that the hen birds sleep with their heads under their wings, lying down, and that the male bird lies with his head stretched out along the ground, probably to guard against surprise.

The method the natives adopt to catch them is to light fires in a large circle of about a mile in circumference in the long grass on the plains, leaving one opening in the circle, at which is stationed several men armed with spears. The fire is made to burn towards the centre of the circle by men and women on the outside, who beat out with bushes all fire likely to spread in any other direction; this drives the Cassowary that are within the circle to the opening, where they are speared by the men stationed there for that purpose. Another method is to place a rope (made of the bark of a tree), with a running-noose at one end and a loop at the other, round the nest, covering it with sand so as to hide it. The native takes the other end (which has been wound round his body) behind a tree, and waits for the bird to come. When she is seated on the nest, in the act of laying an egg, he pulls the rope and the noose catches the legs of the Cassowary; he then runs with the other end to a tree, and takes a round turn, which holds the bird in its struggle to escape until it is quite tired out and helpless: he then dispatches it with his spear. One man, when I was in the Goonuw district (New Britain), met with his death in the following peculiar manner whilst waiting for a Cassowary to come to its nest. Having his rope

already laid, he fell asleep; in the meanwhile the bird came to its nest and laid its egg, but, when going away, got one of its legs entangled in the noose. Thus the man who had the rope wound round his body was dragged along the ground, and, I suppose, struck against a tree, which stunned or killed him. Both the body of the man and the bird were found dead some days afterwards, still fastened together by the rope, at some considerable distance from the nest.

The bones of the Cassowary are used in many ways by the natives, the leg-bones being prized to put on the butt end of spears to balance them; others of the bones are used for spatulas, knives, &c. The feathers are made into head-dresses and brushes for driving flies away. The sharp-pointed claws from the toe are in one part of New Britain used for points of spears, and are fastened on with wax, which when the spear is imbedded in the body melts, so that when the wooden part of the spear is drawn out the horn point remains in the flesh.

These birds become quite domesticated and tame if kept about a house, and will follow like a dog and feed out of the hand. They have a peculiar cry, beginning high and coming down the scale about five notes. The natives have adopted this cry as their war-cry. The young ones make a whistling noise, also when feeding make a chirping something like a chicken, only considerably louder.

The young on leaving the egg is left to shift for itself, and does not join a flock until it attains maturity, which, the natives tell me, takes about five years. The young bird is far from pretty, being covered with a light brown down, which grows darker as the bird ages, until it reaches the rich black of the full-grown bird. The wings are very small in comparison to its size, having no pinion-feathers, but in their place four black spine-quills, which the natives prize to wear through the cartilage of the nose. The horny comb on the head of the male bird is used by him for pushing its way through the thick scrub, which is very dense in some places, being often composed of the prickly palm and a creeping cane which is covered with sharp thorns, and which would, were it not for the comb, tear the head of the bird.

It is a curious fact that there is no Cassowary in New Ireland, it only being distant from New Britain thirty miles, with Duke-of-York Island lying between them, which also has no Cassowary on it. I saw some fossil footprints on a large flat rock near the shore in New Ireland which appeared to me to be those of Cassowary's feet, being those of a large bird with only the three front toes, which, if they should be Cassowary's footprints, tend to show that they must have been there at one time.

The flesh of the Morroop is often eaten by the natives, and the oil that is extracted from the fat is considered very valuable as a remedy for rheumatism. Altogether the Cassowary is an extremely useful bird to the natives in every way, and would form a most interesting study to the naturalist.



11. List of the certainly known Species of *Anatidæ*, with Notes on such as have been Introduced into the Zoological Gardens of Europe, and Remarks on their Distribution. By P. L. SCLATER, M.A., Ph.D., F.R.S., Secretary to the Society.

[Received June 14, 1880.]

### CONTENTS.

A. Introductory Remarks, p. 496.	H. Erismaturinæ, p. 529.
B. Anseranatinæ, p. 497.	I. Merganettinæ, p. 530.
C. Cereopsinæ, p. 497.	J. Merginæ, p. 531.
D. Anserinæ, p. 498.	K. Conclusions as to Introduction,
E. Cygninæ, p. 505.	p. 532.
F. Anatinæ, p. 508.	L. Remarks on the Geographical Dis-
G. Fuligininæ, p. 524.	tribution of the Anatidæ, p. 532.

### A. INTRODUCTORY REMARKS.

There is certainly no group in the class of birds that offers such excellent subjects for "acclimatization," as it is often called (that is, for introduction into foreign countries and reproduction in captivity), as the Anatidæ. There can be no doubt that nearly all of the Geese, Swans, and River-Ducks may be easily tamed and bred in a semidomestic state if proper means are employed; and even of the Sea-Ducks and Mergansers, naturally much more wild and less suited for life in small ponds, some do exceedingly well in captivity.

The Zoological Society of London have always paid great attention to "Water-fowl," as they are commonly called, and have been the first to import and breed in Europe many of the rarer exotic species. I believe also that our collection of these birds is by far the most extensive in existence. During the past twenty years, examples of about 86 species of Anatidæ have been exhibited in the Gardens, and at the present time we have in them about 270 individuals, belonging to 53 species. Being always anxious to increase our stock of these beautiful birds, I have thought that it might be well to draw up a list of the certainly known species of Anatidæ, and to add notes upon such as have been already introduced, and the date of their introduction when known. By specifying the principal *species desideratæ*, I hope also in this manner to induce some of our many excellent correspondents and friends in various parts of the world to supply our wants.

In former years, I should remark, before proceeding to my list, the Thirteenth Earl of Derby, President of this Society, was the great introducer of foreign Water-fowl in Europe. In his celebrated Menagerie at Knowsley special attention was devoted to this group of birds, and at the dispersal of that famous collection by auction,

in October 1851, examples of no less than 51 species<sup>1</sup> were disposed of, some of the most select of which were acquired by this Society.

The dispersal of this splendid series under the hammer of the auctioneer was an event which must always be regretted by ornithologists. Still more unfortunate is it that not one of the numerous owners of well-watered parks and grounds in this kingdom have taken up the subject and devoted themselves to the task of forming a living collection of these beautiful birds.

The following arrangement of the subfamilies of the Anatidæ (based upon their most obvious external character) is slightly modified from that employed in the 'List of Vertebrates':—

- |                                       |                           |
|---------------------------------------|---------------------------|
| A. Digito postico simplice.           |                           |
| a. Pedibus semipalmatis .....         | 1. <i>Anseranatinae</i> . |
| b. Pedibus palmatis.                  |                           |
| a'. Collo modico.                     |                           |
| a''. Cera rostri ampla .....          | 2. <i>Cereopsinae</i> .   |
| b''. Cera rostri nulla .....          | 3. <i>Anserinae</i> .     |
| b'. Collo elongato .....              | 4. <i>Cygninae</i> .      |
| B. Digito postico anguste lobato..... | 5. <i>Anatinae</i> .      |
| C. Digito postico late lobato.        |                           |
| c'. Rostro depresso.                  |                           |
| Cauda rigidiuscula .....              | 6. <i>Fuligulinae</i> .   |
| Cauda spinosa .....                   | 7. <i>Erismatulinae</i> . |
| d'. Rostro compresso.                 |                           |
| Cauda elongata, rigida .....          | 8. <i>Merganettinae</i> . |
| Cauda modica .....                    | 9. <i>Merginae</i> .      |

## B. Subfam. I. ANSERANATINÆ.

### Genus ANSERANAS.

1. *ANSERANAS MELANOLEUCA* (Lath.). Black-and-White Goose.

*Anseranas melanoleuca*, Gould, B. Austr. vii. t. 2.

*Hab.* Australia.

The Black-and-White, or Semipalmated Goose, of Australia was first received by the Society in 1855<sup>2</sup>. It has never bred with us, nor am I aware that it has done so in any of the continental gardens, although several of them possess specimens.

## C. Subfam. II. CEREOPSISINÆ.

### Genus CEREOPSIS.

1. *CEREOPSIS NOVÆ-HOLLANDIÆ*, Lath. Cereopsis Goose.

*Cereopsis novæ-hollandiæ*, Gould, B. Austr. vii. t. 1.

*Hab.* Australia.

In 1830 seven *Cereopsis* Geese were among the animals presented to the Society by King William (see Rep. Council, 1831, p. 14). The species bred frequently in the Gardens, in the early years of the Society (Rep. of Council, 1832, p. 13, and List of Animals,

<sup>1</sup> See Catalogue of the Menagerie and Aviary at Knowsley, formed by the late Earl of Derby, K.G., President of the Zoological Society of London. Liverpool, 1851.

<sup>2</sup> See Rep. of Council, 1856, p. 13.

1844, p. 7), but has not done so since 1860. Fresh introductions are much needed to keep this bird firmly established in Europe.

*Dates of Hatching of Cereopsis Geese.*

1835. April 15th.	1847. May 15th.
1837. „ 10th.	1850. April 9th.
„ May 22nd.	„ May 3rd.
1838. „ 5th.	1851. April 24th.
1841. „ 12th.	1852. March 30th.
1842. „ 4th.	1853. May 9th.
1843. „ 12th.	1855. „ 5th.
1844. April 9th.	1856. March 29th.
„ May 19th.	1857. April 29th.
1846. „ 31st.	1860. „ 21st.

D. Subfam. III. ANSERINÆ.

Genus PLECTROPTERUS.

1. PLECTROPTERUS GAMBENSIS (Linn.). Spur-winged Goose.

*Spur-winged Goose*, Lath. Syn. iii. pt. 2, p. 452, t. 102; Bennett, Gard. & Men. Zool. Soc. ii. p. 207 (1835).

*Plectropterus gambensis*, ScL. P. Z. S. 1859, p. 131, t. cliii.

*Hab.* Western and Southern Africa.

The Spur-winged Goose was one of the earliest inhabitants of the Society's Gardens, examples having been received in 1830. It has never actually hatched young ones in the Gardens, though eggs were laid in 1868<sup>1</sup>; nor am I aware that it has bred on the continent.

2. PLECTROPTERUS RUEPPELLI, ScL. Rüppell's Spur-winged Goose.

*Plectropterus rueppelli*, ScL. P. Z. S. 1859, p. 131, t. cliii., 1860, p. 42, 1876, p. 696, 1877, p. 48.

*Hab.* Abyssinia.

This species was originally described from examples living in the Gardens. It has not bred with us.

3. PLECTROPTERUS NIGER, ScL. Black Spur-winged Goose.

*Plectropterus niger*, ScL. P. Z. S. 1877, p. 47, t. vii., et 1879, p. 5.

*Hab.* Zanzibar coast of Africa.

Also originally described from examples in the Gardens.

Genus CHENALOPEX.

4. CHENALOPEX ÆGYPTIACA (Linn.). Egyptian Goose.

*Chenalopex ægyptiaca*, Gould, B. Eur. v. t. 353.

*Hab.* Africa.

An old introduction to these Gardens, occurring in the earliest catalogues (Rep. of Council, 1831, p. 22), and a constant breeder. Also common in other Gardens, and apparently firmly established.

<sup>1</sup> See P. Z. S. 1877, p. 48.

*Dates of Hatching of Egyptian Geese.*

1837. May 31st.	1846. April 3rd.
„ June 2nd.	1847. „ 12th.
„ July 9th.	1848. March 4th.
1838. April 23rd.	1850. June 5th.
1839. May 24th.	1868. May 24th.
„ „ 27th.	1869. June 6th.
„ June 30th.	1870. May 21st.
1840. March 13th.	1871. „ 3rd.
„ May 2nd.	1872. June 21st.
1842. April 13th.	1873. „ 14th.
1843. July 18th.	1874. July 16th.
1844. June 13th.	1879. June 4th.
1845. May 5th.	

5. CHENALOPEX JUBATA (Spix)<sup>1</sup>. Orinoco Goose.*Anser jubatus*, Spix, Av. Bras. ii. t. 108.*Chenalopex jubata*, Gray et Mitch. Gen. B. iii. t. clxiv.*Hab.* Lower Amazonia.

Introduced, I believe, by Lord Derby at Knowsley, where it bred freely for many years (see 'Gleanings,' vol. ii. sub tab. xv.). It has not bred with us, at any rate of late years, although we have had specimens ever since 1830.

## Genus ANSER.

## 6. ANSER CINEREUS, Meyer. Grey-Lag Goose.

*Anser ferus*, Gould, B. Gt. Brit. v. t. i.*Hab.* Palearctic Region.

The Grey-Lag Goose occurs in the earliest lists (Rep. Council, 1831, p. 22), and is recorded as having bred in the Gardens in 1842 (April 21st). In 1843, as mentioned in Yarrell's 'Birds' (iii. p. 34), the Grey-Lag crossed with the Domestic Goose in the Gardens. Some of the produce were exhibited by Mr. Bartlett at the "Prize-Poultry Show" held in the Gardens by the Society in June 1845, and obtained a prize. "Cross-bred Geese," probably of the same stock, were also hatched in several subsequent years, as will be seen by the subjoined table.

*Dates of Hatching of Wild Geese.*

1842. April 21st.	1845. May 5th. Half-bred.
1843. „ 26th. Half-bred.	1846. April 24th. Cross-bred.
„ May 28th. „	1847. May 7th. „ „
1844. „ 7th. „	1851. April 27th. „ „
„ „ 9th. „	

<sup>1</sup> Gray (Hand-l. iii. p. 74) gives this species as the type of Brandt's generic term *Chenonetta*. But Brandt instituted that generic name in 1836 (Ic. An. Ross. i. p. 5), for *Anas jubata*, Lath., i. e. *Bernicla jubata* of Australia.

## 7. ANSER BRACHYRHYNCHUS, Baill. Pink-footed Goose.

*Anser brachyrhynchus*, Gould, B. Gt. Brit. v. t. iii.*Hab.* Palæarctic Region.

Occasionally exhibited in the Gardens (1840<sup>1</sup> and 1861), but has never, so far as I am aware, bred in confinement, although eggs were laid in St. James's Park (see Yarrell, B. B. iii. p. 50).

## 8. ANSER SEGETUM, Linn. Bean-Goose.

*Anser segetum*, Gould, B. Gt. Br. v. t. ii.*Hab.* Northern Europe and Asia.

In the earliest lists of animals; but I am not aware that it has ever bred in our Gardens, although Mr. Bartlett tells me it did so in St. James's Park in former years.

## 9. ANSER MIDDENDORFI, Severtz. Middendorf's Goose.

*Anser grandis*, Midd. Sib. Reise, ii. pt. ii. p. 125, t. xx. fig. 1.

*Anser middendorfi*, Severtz. Turk. Jevotn. p. 149; Ibis, 1876, p. 416.

*Hab.* N.E. Asia.

This "large form of the Bean-Goose" we have not yet seen in Western Europe.

## 10. ANSER ALBIFRONS (Scop.). White-fronted Goose.

*Anser albifrons*, Gould, B. Gt. Brit. v. t. iv.*Hab.* Palæarctic Region.

The White-fronted Goose has been in the Collection since 1830, and bred in the Gardens in 1843 (June 11). In 1844 a hybrid between this species and *Bernicla leucopsis* was in the Gardens, presented by Lord Derby (List of An. 1844, p. 26).

## 11. ANSER GAMBELI, Hartl. Gambel's Goose.

*Anser gambelii*, Baird, B. N. A. p. 761.*Hab.* North America.

I am not aware that this form of the White-fronted Goose (if distinct from *A. albifrons*) has been introduced into Europe.

## 12. ANSER ERYTHROPUS, Linn. Little Goose.

*Anser erythropus*, Dresser, B. Eur. pts. 75, 76.*Hab.* Palæarctic Region.

First obtained by the Society, I believe, from Holland in 1852 (Rep. of Council, 1853, *A. minutus*), but has never bred with us.

## 13. ANSER INDICUS, Gm. Bar-headed Goose.

*Anser indicus*, Gould, Cent. B. t. 80.

*Anser skorniakooi*, Severtz. Turkest. Jevotn. t. x.; Ibis, 1876, p. 419.

*Hab.* Central Asia and Northern India.

Has been in the Collection since 1845, but has never bred with

<sup>1</sup> See Rep. of Council, 1841, p. 14.

us, though it has done so in the gardens of Antwerp and Berlin, and, I believe, of Liège.

14. ANSER CYGNOIDES, Linn. Chinese Goose.

*Anser grandis*, Gm. et Pall. (?).

*Hab.* China.

The domestic Swan-Goose, introduced from China, has been in the Gardens since 1831, and breeds readily *inter se*. It also hybridizes readily with the Domestic Goose and with *Bernicla canadensis*.

15. ANSER HYPERBOREUS, Pallas. Snow-Goose.

*Anser hyperboreus*, Gould, B. Eur. t. 346.

*Hab.* Northern Europe, Asia, and America.

I have never yet seen the Snow Goose alive, but there were formerly examples of it in the Knowsley Menagerie. It would be a fine addition to our Collection, and, I suppose, might easily be obtained in British Columbia. Nor have the allied forms of this species (*A. albatius* and *A. cærulescens*), so far as I know, been imported, at any rate of late years.

16. ANSER ALBATUS (Cass.). Cassin's Snow-Goose.

*Chen albatius*, Elliot, B. N. A. ii. t. xlii.

*Hab.* Arctic America.

17. ANSER CÆRULESCENS (Linn.). Blue Snow-Goose.

*Chen cærulescens*, Elliot, B. N. A. ii. t. xliii.

*Hab.* Arctic America.

18. ANSER ROSSI, Baird. Ross's Goose.

*Exanthemops rossii*, Elliot, B. N. Am. t. xlv.

*Hab.* Arctic America.

This Goose is also still unknown in captivity.

19. ANSER CANAGICUS (Sewartz.). Emperor Goose.

*Chloëphaga canagica*, Elliot, B. N. A. t. xlv.

*Hab.* N.E. Asia and N.W. America.

This fine Goose has not yet been introduced into Europe. It would be a great acquisition.

Genus BERNICLA.

a. *Species Arcticæ.*

20. BERNICLA LEUCOPSIS (Bechst.). Bernicle Goose.

*Bernicla leucopsis*, Gould, B. Gt. Brit. t. v.

*Hab.* Palæarctic Region.

This Bernicle occurs in the earliest lists (Rep. Council, 1833); and young ones were hatched in the Gardens in 1848 (May 23). It breeds freely in captivity.

21. *BERNICLA CANADENSIS* (Linn.). Canada Goose.*Bernicla canadensis*, Wils. Am. Orn. vol. viii. pl. lxxvii. fig. 4.*Hab.* Nearctic Region.

The Canada Goose occurs in the earliest lists (Rep. Council, 1831). I do not find notices of its having bred in our Gardens; but it is common in many ornamental waters and parks, and breeds very freely in semicaptivity.

22. *BERNICLA HUTCHINSI*, Rich. Hutchins's Goose.*Bernicla hutchinsi*, Aud. B. Am. vi. pl. 377.*Hab.* Arctic America.

We have once received (in 1860) an example of this smaller form of the Canada Goose.

23. *BERNICLA BRENTA* (Pallas). Brent Goose.*Bernicla brenta*, Gould, B. Gt. Brit. t. vii.*Hab.* Palæarctic Region.

The Brent Goose occurs in the earliest list (Rep. Council, 1831), and is always represented in our series. I am not aware that it has bred in captivity.

24. *BERNICLA NIGRICANS*, Lawr. Black Brent Goose.*Bernicla nigricans*, Cass. Ill. B. Cal. t. x.*Hab.* North America.

I have never seen this Goose in captivity. It would be a fine acquisition to our ponds.

25. *BERNICLA RUFICOLLIS* (Pall.). Red-breasted Goose.*Bernicla ruficollis*, Gould, B. Gt. Brit. t. vi.*Hab.* Palæarctic Region.

A female of this fine species, received in exchange in 1853, lived many years in the Gardens, and paired with a male Brent, but did not actually breed.

b. *Species Æthiopicæ.*26. *BERNICLA CYANOPTERA*, Rüpp. Blue-winged Goose.*Bernicla cyanoptera*, Rüpp. Syst. Ueb. t. 47.*Hab.* Southern Abyssinia.

This fine Goose has not yet been introduced, but M. Cornély tells me he is hoping to receive specimens from Upper Nubia before long.

c. *Species Neotropicæ.*27. *BERNICLA MAGELLANICA* (Gm.). Upland Goose.*Oye des terres Magellaniques*, Daub. Pl. Enl. 1006 (♀).

*Chloëphaga magellanica*, Scl. P. Z. S. 1857, p. 128, et Zool. Sketch. ii. t. 48.

*Hab.* Falkland Islands.

The first pair of "Upland Geese" were acquired from Governor

Moore, of the Falkland Islands, in 1857; and a second pair was received in 1861. The first young birds were hatched in 1863; and the species has since bred with us with tolerable regularity, as will be seen by the following list.

*Dates of Hatching of Upland Geese.*

1863. May 4th.	1872. April 22nd.
1865. April 30th.	1874. „ 25th.
1868. May 25th.	„ May 5th.
1869. „ 21st.	„ „ 17th.
1870. „ 8th.	1875. April 29th.
1871. April 23rd.	1878. June 15th.

28. *BERNICLA DISPAR* (Phil. et Landb.). Chilian Goose.

*B. magellanica*, Cassin, Gilliss's Exp. ii. t. 24.

*B. dispar*, Phil. et Landb. Wieg. Arch. 1863, i. p. 190; Sci. et Salv. P. Z. S. 1866, p. 364.

*Hab.* Chili.

We first received examples of this form of the Magellanic Goose in 1871. The female having died, the male was lent to a correspondent, who placed it along with a female *B. magellanica*. In 1875 this pair bred and produced hybrid birds, of which a pair were received in exchange by the Society (see P. Z. S. 1876, p. 365, where they are figured).

We have since received several pairs of the pure bird from South America.

29. *BERNICLA POLIOCEPHALA*, Sclater. Ashy-headed Goose.

*Chloëphaga poliocephala*, Sci. P. Z. S. 1860, p. 388, et Zool. Sk. i. t. 49; Sci. et Salv. P. Z. S. 1876, p. 366.

*Bernicla inornata*, Gray & Mitch. Gen. B. iii. t. 163.

*Hab.* Antarctic America.

The first examples of this Goose were received in 1833. It bred frequently in the Gardens from 1852 to 1869, when we unfortunately lost most of our stock. We have quite lately succeeded in obtaining some newly imported birds, and hope now to begin breeding them again.

*Dates of Hatching of Ashy-headed Geese.*

1852. June 9th.	1860. May 27th.
1854. May 24th.	1865. „ 25th.
1857. „ 23rd.	1867. „ 23rd.
1858. June 7th.	1868. „ 25th.
1859. May 21st.	1869. June 1st.
„ June 2nd.	

30. *BERNICLA RUBIDICEPS*, Sclater. Ruddy-headed Goose.

*Chloëphaga rubidiceps*, Sci. P. Z. S. 1860, t. clxxiii.

*Bernicla rubidiceps*, Sci. et Salv. P. Z. S. 1876, p. 367.

*Hab.* Falkland Islands.

Two pairs of this Goose were obtained from the Falklands in 1860,



but they did not breed until 1865. We have unfortunately now lost our whole stock of this bird.

*Dates of Hatching of Ruddy-headed Geese.*

1865. April 30th.	1868. May 1st.
1866. May 8th.	"    "    25th.
"    June 5th.	1869. June 6th.
1867. May 18th.	1870. May 11th.
"    June 4th.	

31. *BERNICLA MELANOPTERA* (Eyt.). Andean Goose.

*Anser melanopterus*, Gould, Zool. Beagle, iii. t. 50 ; Scl. et Salv. P. Z. S. 1876, p. 362.

*Hab.* Antarctic America.

We have received several pairs of this Goose, but have never succeeded in getting it to breed.

32. *BERNICLA ANTARCTICA* (Gm.). Kelp Goose.

*Bernicla antarctica*, Cassin, Gilliss's Exp. ii. t. 23.

*Hab.* Antarctic America.

A single example of this Goose was imported in 1868.

d. *Species reg. Australianæ.*

33. *BERNICLA JUBATA* (Lath.). Maned Goose.

*B. jubata*, Gould, B. Austr. vii. t. 3 ; Sclater, P. Z. S. 1864, p. 587.

*Hab.* Australia.

We have had examples of both sexes of this Goose in the Gardens since 1864, but it has never bred with us ; nor am I aware that it has done so in other gardens on the Continent.

34. *BERNICLA SANDVICENSIS* (Vig.). Sandwich-Island Goose.

*B. sandvicensis*, Jard. et Selb. Ill. Orn. iv. t. 8.

*Hab.* Sandwich Islands.

This species was originally based by Mr. Vigors on a pair of birds living in the Society's Gardens, to which they were presented by Lady Glengall in 1832 (see P. Z. S. 1833, p. 63, and Rep. of Council, 1833, p. 13). In 1834 a pair was also received by Lord Derby at Knowsley (see P. Z. S. 1834, p. 41). They bred in both places ; and in subsequent years our pair and their descendants bred frequently in the Society's Gardens.

*Dates of Hatching of Sandwich-Island Geese.*

1835. May 7th.	1839. May 8th.
1837. April 6th.	"    "    10th.
"    "    12th.	"    "    30th.
1839.    "    11th.	1840. April 21st.
"    "    16th.	"    "    23rd.

1841. April 8th.	1849. March 20th.
"    "    16th.	1850.    "    31st.
"    "    27th.	"    April 20th.
"    May 3rd.	"    May 5th.
"    "    9th.	1851. April 3rd.
1842. April 3rd.	1853. March 21st.
"    "    30th.	"    April 24th.
"    May 9th.	"    May 9th.
1843.    "    11th.	1854.    "    15th.
1844. April 19th.	1856. April 3rd.
1845.    "    26th.	1857.    "    17th.
1846. March 27th.	1859.    "    18th.
"    April 8th.	1864.    "    5th.
1847.    "    17th.	1871. May 23rd.

## Genus NETTOPUS.

No example of any species of this beautiful genus has, so far as I know, been yet brought alive to Europe.

## 35. NETTOPUS AURITUS (Bodd.). Eared Pigmy Goose.

*Sarcelle mâle de Madagascar*, Daub. Pl. Enl. 770.

*Nettapus auritus*, Hartl. Vög. Madagasc. p. 357.

*Hab.* Tropical Africa and Madagascar.

## 36. NETTOPUS COROMANDELIANUS (Gm.). Indian Pigmy Goose.

*Anas girra*, Gray, Ind. Zool. i. t. 68.

*Hab.* India and Malacca.

## 37. NETTOPUS ALBIPENNIS, Gould. White-winged Pigmy Goose.

*Nettapus coromandelianus*, Gould, B. Austr. vii. t. 5.

*Hab.* Eastern Australia.

## 38. NETTOPUS PULCHELLUS, Gould. Beautiful Pigmy Goose.

*Nettapus pulchellus*, Gould, B. Austr. vii. t.

*Hab.* Northern Australia.

## E. Subfam. IV. CYGNINÆ.

## Genus CYGNUS.

## 1. CYGNUS OLOR (Gm.). Common Swan.

*Cygnus olor*, Gould, B. G. Brit. v. t. 8.

*Hab.* Palæarctic Region.

This Swan is better known in a semidomestic than in a wild state, and breeds abundantly in captivity.

## 2. CYGNUS IMMUTABILIS, Yarr. Polish Swan.

*Cygnus immutabilis*, Yarr. Brit. B. iii. p. 131.*Hab.* Northern Europe.

In one of our registers it is said that an example of this species was in the Gardens in 1830, but it is not included in the general list of 1831.

Mr. Yarrell speaks of a pair of this species (or subspecies of *C. olor*) as living at Knowsley, where the male paired with a female Mute Swan and produced hybrids, and two were sold at the Knowsley sale in 1851.

In 1871 we obtained a living pair of this Swan, which were subsequently deposited with Mr. J. H. Gurney, F.Z.S., for the purpose of breeding. See Mr. Gurney's note on this subject, P. Z. S. 1876, p. 466.

Mr. Gurney has kindly furnished me with the subjoined additional particulars:—

"I fear I cannot give you much information respecting the breeding of the Polish Swans or the colour of their cygnets beyond what is contained in my note in the P. Z. S. for 1877, p. 579.

"They have reared a brood during each subsequent year; but as I have been from home more or less every spring I have kept no detailed notes about them since 1877. The number they have hatched annually has varied from 4 to 6, so that they are not a very prolific pair as compared with some common Swans. This year they hatched four, of which one was killed by rats. All the cygnets have resembled in colour those described in my former note."

## 3. CYGNUS MUSICUS, Bechst. Hooper Swan.

*Cygnus ferus*, Gould, B. G. Brit. v. t. 9.*Hab.* Palæarctic Region.

The Hooper bred in the Society's Gardens in 1839 (June 16), 1841 (May 27), and in 1842 (May 20), but has not done so of late years. It cannot be considered by any means a free breeder in confinement.

## 4. CYGNUS AMERICANUS, Sharpless. American Swan.

*Cygnus americanus*, Baird, B. N. A. p. 758.*Hab.* North America.

I have never heard of this Swan having been brought alive to Europe, nor am I aware that it has been exhibited in any of the American gardens.

## 5. CYGNUS BUCCINATOR, Rich. Trumpeter Swan.

*Cygnus buccinator*, Baird, B. N. A. p. 578.*Hab.* Western North America.

Our first examples of this Swan were received in 1866 (see P. Z. S. 1866, p. 203). The first pair bred in 1870 (June 6th) (see P. Z. S. 1870, p. 664). Young ones were also bred every subsequent year up to 1876, but our stock is now unfortunately reduced to a single bird.

*Dates of Hatching of Trumpeter Swans.*

1870. July 6th.	1874. May 30th.
1871. June 3rd.	1875. June 28th.
1872. „ 6th.	1876. „ 11th.
1873. „ 8th.	

6. *CYGNUS BEWICKI*, Yarrell. Bewick's Swan.*Cygnus minor*, Gould, B. G. Brit. v. t. 10.*Hab.* North Palæarctic Region.

Bewick's Swan (represented in our series in 1878 and now by a single bird) has never bred in captivity, so far as I know. Two were sold at the Knowsley sale in 1851.

7. *CYGNUS DAVIDI*, Swinh. Père David's Swan.

*Cygnus davidi*, Swinh. P. Z. S. 1870, p. 430; David et Oust. Ois. Chine, p. 494.

*Hab.* Northern China.

Only yet known by a single specimen at Pekin!

8. *CYGNUS ATRATUS* (Lath.). Black Swan.*Cygnus atratus*, Gould, B. Austr. vii. t. 6.*Hab.* Australia.

The Black Swan is in the first list of living animals given in the Council's Report for 1831 (p. 15). I find records of its having hatched at the following dates, which are of interest, as showing that there is much variation in this respect in an Antarctic species.

*Dates of Hatching of Black Swans.*

1837. May 16th.	1848. April 10th.
„ August 4th.	1849. „ 1st.
„ „ 8th.	„ October 4th.
1838. September 12th.	1850. March 21st.
1839. August 11th.	„ April 14th.
1840. April 10th.	1851. March 2nd.
1841. „ 21st.	1852. „ 26th.
1842. „ 21st.	1860. „ 29th.
1843. March 20th.	1864. November 11th.
1844. April 16th.	1877. March 31st.
1846. March 31st.	1878. „ 11th.
1847. October 24th.	

The male Black Swan has also mated with the female Common Swan and produced party-coloured hybrids. See Lord Derby's note on this subject, P. Z. S. 1847, p. 97.

9. *CYGNUS COSCOROBA* (Mol.). Coscoroba Swan.

*Cygnus coscoroba*, Gr. et Mitch. Gen. B. iii. t. 166; Schl. et Salv. P. Z. S. 1876, p. 371.

*Hab.* Antarctic America.

This beautiful Swan was first obtained by us in 1870 (see

P. Z. S. 1870, p. 666). There are examples in several of the Continental gardens also, but I am not aware that they have bred in any case.

10. *CYGNUS NIGRICOLLIS* (Gm.). Black-necked Swan.

*Cygnus nigricollis*, Wolf, *Sci. Zool. Sk. i. t.* 48; *Sci. et Salv.* P. Z. S. 1876, p. 370.

*Hab.* Antarctic America.

"The first importation of the Black-necked Swan was effected by the exertions of Admiral Hornby. When this officer was in command on the Pacific station he succeeded in sending home at different periods, to the late Earl of Derby, eight individuals of this species, of which six were living at the dispersion of the Knowsley collection in 1851<sup>1</sup>. The present Earl of Derby presented a pair of these birds to Her Majesty the Queen, and the two remaining pairs passed into the possession of the Zoological Society. They, however, for several seasons made no attempt at reproduction, and one of them having died, the apparent chance of continuing the species depended on one pair. Fortunately, in the year 1857, these not only made a nest, as had been done in 1856, but hatched out four young birds, which rapidly arrived at full size and colour, and at the end of the autumn could scarcely be distinguished from their parents. The same success occurred in 1858, with the fortunate and singular result that the four birds of 1857 were all males, and the birds of 1858 females." (Sclater and Wolf, *Zool. Sketches*, i. sub tab. xlviii.)

Since this was written (in 1861) numerous importations of the Black-necked Swan have taken place, and the species may be considered completely established in Europe. We have eight examples of it now in the Gardens.

The subjoined list gives the dates of the hatchings.

*Dates of Hatching of Black-necked Swans.*

1857. June 23rd.	1868. June 22nd.
1858. July 3rd.	1873. July 3rd.
1859. June 27th.	1877. „ 10th.
1865. May 19th.	1878. „ 20th.
1866. „ 4th.	1879. May 23rd.
1867. „ 9th.	

F. Subfam. V. ANATINÆ.

Genus *DENDROCYGNA*<sup>2</sup>.

Examples of the eight out of the ten known species of this genus have been exhibited in the Society's Gardens; but the only instance of any one of them breeding took place in 1872, when a pair of *Dendrocygna fulva* mated and two young ones were hatched.

<sup>1</sup> See Knowsley Sale-list, p. 44.

<sup>2</sup> This generic name being a compound of *κίρκος*, should clearly be written thus, not *Dendrocygna*, as usually spelt.

On the species of this genus my previous notes (P. Z. S. 1864, p. 299, et 1866, p. 148) should be consulted.

1. *DENDROCYCNA VIDUATA* (Linn.). White-faced Tree-Duck.

*Dendrocygna viduata*, Scl. et Salv. P. Z. S. 1876, p. 376.

*Hab.* South America, Africa, and Madagascar.

The White-faced Tree-Duck was first received from Brazil in 1835, and again in 1862, when Mr. Christie sent us examples. We have since obtained many specimens.

2. *DENDROCYCNA AUTUMNALIS* (Linn.). Red-billed Tree-Duck,

*Dendrocygna autumnalis*, Scl. et Salv. P. Z. S. 1876, p. 373.

*Hab.* Mexico and Central America.

This Tree-Duck is enumerated in the first list of animals given in the Council's Report for 1831 (p. 22). We have since received many specimens of it.

3. *DENDROCYCNA DISCOLOR*, Scl. et Salv. Southern Red-billed Tree-Duck.

*Dendrocygna discolor*, Scl. et Salv. P. Z. S. 1876, p. 375.

*Hab.* South America.

Received from Para in 1874 (see P. Z. S. 1864, p. 299), and since frequently exhibited.

4. *DENDROCYCNA ARBOREA* (Linn.). Black-billed Tree-Duck.

*Dendrocygna arborea*, Scl. et Salv. P. Z. S. 1876, p. 375.

*Hab.* West Indies.

Recorded in the list of animals of 1831, and frequently received since.

5. *DENDROCYCNA GUTTULATA*, Müll. Müller's Tree-Duck.

*Dendrocygna guttulata*, Scl. P. Z. S. 1864, p. 300.

*Hab.* Moluccas.

Not yet imported, so far as I know.

6. *DENDROCYCNA FULVA* (Gm.). Fulvous Tree-Duck.

*Dendrocygna fulva*, Scl. et Salv. P. Z. S. 1876, p. 373.

*Hab.* Mexico and Brazil.

Our first examples of this Tree-Duck were obtained in 1867 (see P. Z. S. 1867, p. 687). Two others were obtained in 1871. In 1872, as above mentioned, the only instance of ducks of this genus breeding took place. Mr. C. Bartlett has furnished me with the following note on this subject:—

“The Fulvous Tree-Ducks bred in the Gardens in the north pond in August 1872, while under my charge. The nest was upon the ground and was domed, the dome being formed of the long grass surrounding the nest. This is the only instance I know of any of the water-fowl building a dome over its nest. Many of the common

water-fowl build in the long grass, but do not attempt to form a dome.

“Two birds were hatched, but unfortunately killed by rats.”

7. *DENDROCYCNA MAJOR*, Jerd. Larger Tree-Duck.

*Dendrocygna major*, Jerd. Ill. Ind. Orn. t. 22; Hartl. Vög. Mad. p. 359; Scl. P. Z. S. 1864, p. 300, et 1861, p. 148.

*Hab.* India, East Africa, and Madagascar.

It is quite doubtful whether this species is distinct from *D. fulva*. We obtained two examples in 1867 (Sept. 18) from the Acclimatization Society of Paris, stated to have been received from Madagascar.

8. *DENDROCYCNA ARCUATA* (Cuv.). Indian Tree-Duck.

*Dendrocygna arcuata*, Scl. P. Z. S. 1864, p. 300.

*Hab.* India and Africa.

A single example of this Tree-Duck was purchased at the Knowsley sale in 1851. In 1857 we again received examples from the Babu Rajendra Mullick, along with other rare Indian animals.

9. *DENDROCYCNA VAGANS*, Fraser. Wandering Tree-Duck.

*Dendrocygna arcuata*, Gould, B. Austr. vii. t. 14.

*Dendrocygna vagans*, Fraser, Zool. Typ. t. 68; Scl. P. Z. S. 1864, p. 300, et 1866, p. 149.

*Hab.* Philippines, Moluccas, and North Australia.

Not yet introduced, so far as I know.

10. *DENDROCYCNA EYTONI* (Gould). Eyton's Tree-Duck.

*Leptotarsis eytoni*, Gould, B. Austr. vii. t. 15.

*Hab.* North-west Australia.

Our excellent friend Dr. G. Bennett, of Sydney, sent us a pair of this species in 1867, the only individuals we have yet received (see P. Z. S. 1867, p. 686); but it was formerly in the Knowsley Menagerie (see Sale-list, p. 45).

Genus *SARCIDIORNIS*.

11. *SARCIDIORNIS MELANONOTA* (Forst.). Indian Wattle-Duck.

*Sarcidiornis melanonota*, Scl. P. Z. S. 1876, p. 694, t. 67.

*Hab.* India.

I find no record of this species having been introduced until 1837, when a pair were acquired by purchase from the Jardin d'Acclimatation of Paris.

Notes on the distinctions between this and *S. carunculata* will be found in my paper above referred to.

No *Sarcidiornis* has yet bred with us.

12. *SARCIDIORNIS AFRICANA*, Eyton. African Wattle-Duck.

*Sarcidiornis africana*, Hartl. Vög. Madagasc. p. 355.

*Hab.* Africa and Madagascar.

An example of this form of *Sarcidiornis* was purchased at the

Knowsley sale in 1851. According to Hartlaub it merely differs from *S. melanonota* in its smaller size.

13. *SARCIDIORNIS CARUNCULATA* (Licht.). American Wattle-Duck.

*Sarcidiornis carunculata*, *Scl. P. Z. S.* 1876, p. 694, t. 68.

*Hab.* South America.

See my notes (above referred to) on this species, which was first received in 1876.

Genus *CAIRINA*.

14. *CAIRINA MOSCHATA* (Linn.). Muscovy Duck.

*Cairina moschata*, *Scl. et Salv. P. Z. S.* 1876, p. 378.

*Hab.* Central and South America.

The domestic "Muscovy Duck," as it is called, has long been introduced into Europe, and breeds readily (*inter se*), besides hybridizing freely with the common Domestic Duck.

In 1851 I find a record of "Wild Muscovy Ducks" having been received from America, and noticed as new to the Collection. We have recently (May 6, 1880) received three examples from Paraguay, which I believe to be probably of the wild race.

Genus *TADORNA*<sup>1</sup>.

15. *TADORNA CORNUTA* (Gm.). Common Sheldrake.

*Tadorna vulpanser*, Gould, *B. G. Brit. v. t. 11*; *Scl. P. Z. S.* 1864, p. 189.

*Hab.* Europe and North Asia.

The Sheldrake is in the earliest list, and in former years bred frequently in the Gardens. It is not, however, a ready breeder in captivity, and requires special treatment.

*Dates of Hatching of Common Sheldrake.*

1835. June 6th.	1845. June 9th.
1842. „ 9th.	1846. May 7th.
1843. May 30th.	1848. „ 27th.
1844. „ 16th.	

16. *TADORNA RADJAH*, Garn. Radjah Sheldrake.

*Tadorna radjah*, Gould, *B. Austr. vii. t. 8*; *Scl. P. Z. S.* 1864, p. 190.

*Hab.* North Australia and Moluccas.

This beautiful Sheldrake would form a fine addition to our introduced Water-fowl. It would, I should say, be easily obtainable in Queensland.

17. *TADORNA RUTILA* (Pall.). Ruddy Sheldrake.

*Casarca rutila*, Gould, *B. G. Brit. v. t. 12*; *Scl. P. Z. S.* 1864, p. 190.

*Hab.* South Europe, West Asia, and North Africa.

<sup>1</sup> Cf. articles, *P. Z. S.* 1864, . 189, and 1866, p. 148, on this genus.



The Ruddy Sheldrake appears to have been first received in these Gardens in 1850, when a pair were obtained from Egypt.

This pair first bred in 1859, as will be seen by reference to my notes above referred to. I add a list of the dates of hatching.

*Dates of Hatching of Ruddy Sheldrake.*

1859. May 13th.	1870. May 19th.
1860. „ 18th.	1871. „ 17th.
1861. June 2nd.	1872. „ 19th.
1867. May 18th.	1873. „ 25th.
1868. „ 20th.	1874. „ 31st.
1869. „ 19th.	

18. *TADORNA CANA* (Gm.). White-fronted Sheldrake.

*Tadorna cana*, Scl. P. Z. S. 1864, p. 190.

*Hab.* South Africa.

The only individual of this species yet received by the Society was the female acquired at the sale of the Knowsley Menagerie in 1851. The facts as to the breeding of this remarkable bird will be found in former communications (P. Z. S. 1859, p. 442, et 1864, p. 191).

19. *TADORNA TADORNOIDES*, Jard. & Selb. Australian Sheldrake.

*Casarca tadornoides*, Gould, B. Austr. vii. t. 7.

*Tadorna tadornoides*, Scl. P. Z. S. 1864, p. 191, t. xviii.

*Hab.* South Australia.

We received females of this species in 1862, and examples of both sexes in 1863. We have now also pairs, but have not yet succeeded in getting them to breed in this country.

20. *TADORNA VARIEGATA* (Gm.). Variegated Sheldrake.

*Tadorna variegata*, Scl. P. Z. S. 1864, p. 191, t. xix., et 1866, p. 149.

*Hab.* New Zealand.

This beautiful species is one of our most successful introductions. First received in 1863, and first bred in 1865, it is now to be found in most of the larger zoological gardens of the Continent.

*Dates of Hatching of the Variegated Sheldrake.*

1865. May 17th.	1873. May 19th.
1866. „ 8th.	1874. „ 27th.
1867. „ 5th.	1875. „ 29th.
1869. „ 12th.	1876. „ 11th.
1870. July 12th.	1877. „ 16th.
„ „ 30th.	1878. June 3rd.
1872. May 29th.	„ May 17th.

21. *TADORNA SCUTULATA*, Müll. White-winged Sheldrake.

*Anas scutulata*, Müll. Verh. Ethn. p. 159; Scl. et Wolf, Zool. Sk. ii. t. 49.

*Casarca leucoptera*, Strickl. Contr. Orn. 1859, p. 114, t. 64.

*Hab.* Java.

Two living examples of this rare Duck were received by the Society from Mr. Blyth in 1851. Mr. Blyth supposed that these birds were from Tenasserim; but it would appear that the species is not of ordinary occurrence in that country (*cf.* Hume & Davison, *Str. Feath.* vi. p. 489). Müller obtained several examples in Java (*Schl. Mus. d. P.-B. Anseres*, p. 64).

Genus STICTONETTA<sup>1</sup>.

22. STICTONETTA NÆVOSA (Gould). Freckled Duck.

*Anas nævosa*, Gould, B. Austr. vii. t. 10.

*Hab.* Australia.

Not yet received alive.

Genus AIX.

23. AIX SPONSA (Linn.). Summer Duck.

*Aix sponsa*, Baird, B. N. Am. p. 785.

*Hab.* North America.

The Summer Duck occurs in the earliest list, and breeds with us nearly every year, as will be seen by the following list:—

*Dates of Hatching of Summer Ducks.*

1831. June 4th.	1857. May 31st.
„ „ 17th.	„ June 21st.
1834. May 12th.	1858. May 31st.
„ June 3rd.	„ June 19th.
„ „ 17th.	1859. May 24th.
1835. „ 6th.	1860. July 5th.
„ „ 13th.	1865. May 23rd.
„ „ 18th.	„ June 9th.
1837. „ 5th.	1866. „ 18th.
1839. „ 5th.	1867. „ 8th.
„ „ 7th.	1869. „ 18th.
1844. May 18th.	1870. May 26th.
1846. June 27th.	1871. June 1st.
„ July 16th.	1873. May 31st.
1848. May 29th.	1874. June 2nd.
1852. June 19th.	1875. „ 16th.
1853. May 29th.	1876. July 1st.
1854. June 11th.	„ „ 10th.
„ „ 15th.	1877. June 5th.
1855. May 29th.	„ „ 21st.
„ July 1st.	1878. „ 28th.

24. AIX GALERICULATA (Linn.). Mandarin Duck.

*Aix galericulata*, Gould, B. Asia, pt. 4 (1852).

*Hab.* China.

The Mandarin was also an inhabitant of the Gardens in 1830,

<sup>1</sup> *Stictonetta*, Reichenb. Syst. Ar. p. ix. (1852).

and first bred with us in 1834. It is perhaps not quite so free a breeder as the Carolina, but does very well if attention be paid to it.

*Dates of Hatching of Mandarin Ducks.*

1834. June 23rd.	1858. May 31st.
" " 26th.	1859. June 2nd.
1837. July 3rd.	1862. ———?
1840. " 14th.	1863. June 1st.
1851. June 18th.	1865. " 14th.
" " 20th.	1866. July 7th.
" July 6th.	1868. June 18th.
1852. June 30th.	1869. July 9th.
1853. " 21st.	1870. June 29th.
" July 3rd.	1871. " 27th.
1854. June 26th.	1872. July 19th.
1856. July 12th.	1874. June 13th.
1857. June 17th.	" July 16th.

Genus MARECA.

25. MARECA PENELOPE (Linn.). Wigeon.

*Mareca penelope*, Gould, B. G. Brit. v. t. 13.

*Hab.* Palæarctic Region.

The Wigeon is in the first list (1831), and has always been represented in the Gardens, but has not bred with us very frequently.

*Dates of Hatching of the Wigeon.*

1870. June 24th.	1874. June 20th.
1872. " 29th.	

26. MARECA AMERICANA (Gm.). American Wigeon.

*Mareca americana*, Baird, B. N. Am. p. 783; Scl. et Salv. P. Z. S. 1876, p. 394.

*Hab.* North America.

The American form of the Wigeon has not yet been imported into Europe, so far as I know.

27. MARECA SIBILATRIX (Poëppig). Chiloe Wigeon.

*Mareca sibilatrix*, Scl. et Salv. P. Z. S. 1876, p. 395.

*Mereca chiloensis*, Eyton, Mon. Anat. pl. 31; Scl. List of An. p. 371 (1879).

*Hab.* Antarctic America.

First imported from Chili in 1870 (see P. Z. S. 1870, p. 667), and commenced breeding the following year. We have now supplied most of the Continental gardens with examples of this highly ornamental species.

*Dates of Hatching of Chiloe Wigeon.*

1871. June 7th.	1875. June 2nd.
1872. May 22nd.	„ July 10th.
1873. „ 29th.	1876. June 7th.
1874. „ 28th.	1878. „ 22nd.
„ July 3rd.	1879. „ 15th.

## Genus DAFILA.

## 28. DAFILA ACUTA (Linn.). Common Pintail.

*Dafila acuta*, Gould, B. G. Brit. v. t. 18.*Hab.* Palearctic and Antarctic Regions.

The Pintail does well in captivity. Its name occurs in the earliest lists, and it breeds freely in our ponds.

In the early years of the Society I find numerous records of its having hybridized with *Anas boschas*. The pure bird is registered as having bred as follows:—

*Dates of Hatching of the Common Pintail.*

1839. May 9th.	1850. June 11th.
1842. „ 5th.	„ „ 15th.
1845. June 16th.	1851. June 5th.
1846. May 26th.	1852. „ 23rd.
„ June 4th.	1853. May 13th.
1847. „ 9th.	1857. June 15th.
1848. May 22nd.	1860. May 16th.
1850. „ 29th.	1861. „ 15th.

## 29. DAFILA ERYTHORHYNCHA (Gm.). Red-billed Duck.

*Anas erythrorhyncha*, Smith, Ill. S. Afr. Zool., Aves, t. 104.*Hab.* South Africa and Madagascar.

The Red-billed Duck was first imported by Lord Derby. Five examples sold at the Knowsley sale in 1851 were acquired by the Society. It bred first in 1856, and continued to do so until 1860. But I regret to say we have now lost this species, which requires re-introduction.

*Dates of Hatching of Red-billed Ducks.*

1856. August 5th.	1859. July 5th.
1857. June 28th.	1860. „ 9th.

## 30. DAFILA SPINICAUDA (Vieill.). Chilian Pintail.

*Dafila spinicauda*, ScL. P. Z. S. 1870, p. 666, t. xxxviii.; ScL. et Salv. P. Z. S. 1876, p. 392.

*Hab.* Antarctic America.

The Chilian Pintail was introduced by Lord Derby, and a single example sold at the Knowsley sale in 1851 was purchased by the Society. It was not obtained again, I believe, until 1870, when

PROC. ZOOL. SOC.—1880, No. XXXIV.

eight examples were procured from Mr. Weisshaupt. These began to breed in 1872. It has thriven well ever since, and we have supplied many of our continental friends with examples of it.

*Dates of Hatching of Chilian Pintail.*

1872. June 11th.	1876. March 10th.
„ „ 22nd.	„ July 24th.
1873. April 28th.	1877. May 1st.
„ May 9th.	„ June 15th.
„ „ 31st.	„ „ 21st.
„ June 16th.	„ „ 26th.
1874. April 22nd.	1878. May 10th.
„ May 9th.	„ „ 23rd.
„ „ 14th.	1879. June 23rd.
1875. April 26th.	„ August 7th.
„ May 11th.	

31. *DAFILA BAHAMENSIS* (Linn.). Bahama Duck.

*Dafila bahamensis*, Scl. & Salv. P. Z. S. 1876, p. 393.

*Hab.* South America.

The Bahama Duck was first obtained by the Society at the Knowsley sale in 1851, and began to breed in 1853. It seems now to be firmly established in Europe.

*Dates of Hatching of Bahama Ducks.*

1853. June 28th.	1865. June 15th.
1854. „ 13th.	„ July 7th.
1855. July 7th.	1866. „ 6th.
1856. June 25th.	1867. June 22nd.
„ July 19th.	„ July 19th.
1857. June 16th.	1868. June 25th.
„ „ 30th.	„ „ 30th.
1858. July 8th.	1869. „ 26th.
1860. „ 31st.	1870. July 6th.
1863. June 1st.	1878. August 31st.

Genus *ANAS*.

32. *ANAS BOSCHAS*, Linn. Common Wild Duck.

*Anas boschas*, Gould, B. G. Brit. v. t. 15.

*Hab.* Palearctic Region.

The Common Wild Duck breeds readily in semi-domestication, and often pairs with the Domestic Duck.

*Dates of Hatching of Wild Ducks.*

1844. April 24th.	1845. May 15th.
1845. May 3rd.	1847. „ 18th.

33. *ANAS MELLERI*, Scl. Meller's Duck.

*Anas melleri*, Sclater, P. Z. S. 1864, p. 487, t. xxxiv.; Hartl. Vög. Madag. p. 360.

*Hab.* Madagascar.

Not yet introduced.

34. *ANAS WYVILLIANA*, Scl. Wyville-Thomson's Duck.

*Anas wyvilliana*, Scl. P. Z. S. 1878, p. 350; Birds Chall. Exp. p. 98, t. xxii.

*Hab.* Sandwich Islands.

Not yet introduced.

35. *ANAS OBSCURA*, Gm. Dusky Duck.

*Anas obscura*, Baird, B. N. A. p. 775.

*Hab.* North America.

The Dusky Duck was introduced into our Gardens in 1850, and bred well until 1867. We have now lost the species; but hope soon to receive it again from some of the Continental gardens or from our American correspondents.

In 1858 and 1859 it hybridized with *A. boschas*.

*Dates of Hatching of Dusky Ducks.*

1851. May 7th.	1858. May 14th (hybrid).
1852. „ 29th.	1859. „ 20th „
„ June 19th.	1860. July 5th.
1853. May 12th.	1861. May 21st.
1854. „ 15th.	1865. „ 23rd.
1855. June 19th.	1866. „ 8th.
1857. May 18th.	1867. „ 10th.

36. *ANAS LUZONICA*, Fraser. Luzon Duck.

*Anas luzonica*, Fraser, Zool. Typ. t. 67.

*Hab.* Philippines.

Not yet introduced into Europe.

37. *ANAS SUPERCILIOSA*, Gm. Australian Wild Duck.

*Anas superciliosa*, Gould, B. Austr. vii. t. 9.

*Hab.* Australia and Pacific Islands.

Our first Australian Wild Duck was received from the late Mr. Edward Wilson, of Melbourne, in 1860. In 1863, 1865, and 1866 we obtained additional specimens from Dr. Mueller and the Acclimatization Society of Melbourne. It first bred in 1869, and may now be considered well established in Europe.

*Dates of Hatching of Australian Wild Ducks.*

1869. June 29th.	1874. June 6th.
1873. „ 24th.	„ „ 20th.
„ „ 9th.	1875. „ 25th.
„ „ 14th.	1878. „ 22nd.
„ „ 19th.	

38. *ANAS XANTHORHYNCHA*, Forst. Yellow-billed Duck.*Anas flavirostris*, Smith, Ill. S. Afr. Zool., Aves, t. 96.*Hab.* South Africa.

The Guilbec, or Yellow-billed Duck, was first obtained at the Knowsley sale in 1851. It bred in 1859 and 1860; and we have supplied some of the Continental gardens with our produce. But I am not quite sure, I regret to say, that our present stock of this Duck is pure-bred.

*Dates of Hatching of Yellow-billed Ducks.*

1859. May 20th.	1868. June 17th.
1860. „ 30th.	1870. „ 18th.
1863. June 1st.	1871. „ 11th (hybrid).

39. *ANAS PÆCILORHYNCHA*, Penn. Spotted-billed Duck.*Anas pæcilorhyncha*, Gray, Ind. Zool. i. t. 67.*Hab.* India.

A single example of this fine Duck was obtained at the Knowsley sale in 1851, but we lost the species; and it was not again introduced, I believe, until 1868, when we received several males from the Babu Rajendra Mullick. In 1872 we received females from Mr. E. Buck (see P. Z. S. 1872, p. 729); and in 1874 the first pure-bred birds were hatched. The species may now be considered fairly established, and is also found in several of the Continental gardens.

*Dates of Hatching of Spotted-billed Duck.*

1874. June 2nd.	1877. June 13th.
1875. „ 2nd.	„ „ 19th.
„ „ 14th.	1879. „ 23rd.
1876. „ 5th.	

40. *ANAS ZONORHYNCHA*, Swinhoe.*Anas zonorhyncha*, Swinh. Ibis, 1866, p. 394.*Hab.* China.

I have not yet seen this close ally of the last species living in Europe.

41. *ANAS SPARSA*, Smith.*Anas sparsa*, Smith, Ill. S. Afr. Zool., Aves, t. 97.*Hab.* South and East Africa.

Not yet introduced.

42. *ANAS CASTANEA* (Eyton). Chestnut-breasted Duck.*Anas punctata*, Gould, B. Austr. vii. t. 11.*Mareca castanea*, Eyton, Mon. Anat. p. 119, t. 22.*Hab.* Australia.

In June 1870 we purchased a single male example of the Australian Duck along with a lot of other animals from the same country. Whether the female obtained in 1865 (and credited to this species in the Cat. of Animals) really belonged here or to the next species, I cannot at present say.

43. *ANAS GIBBERIFRONS*, Müll. Müller's Duck.*Querquedula gibberifrons*, Buller, B. New Zealand, p. 250.*Anas gracilis*, Buller, Ibis, 1869, p. 41.*Mareca albigularis*, Hume, Str. F. i. p. 303.*Hab.* Celebes, Moluccas, Australia, New Zealand.

Eighteen Australian Ducks which we purchased of a dealer in August last, and entered as *A. castanea*, I now believe to belong to this species, which much resembles the *female* of *A. castanea*. (See above, p. 518.)

Several pairs have been obtained out of the above-mentioned lot; and we expect that they will breed with us this year.

44. *ANAS BERNIERI*, Verr. Bernier's Duck.*Anas bernieri*, Hartl. Vög. Madag. p. 363.*Hab.* Madagascar.

Not yet introduced.

45. *ANAS CHLOROTIS*, Gray. Brown Duck.*Anas chlorotis*, G. R. Gr. Voy. Ereb. & Terr. Aves, t. 20.*Hab.* New Zealand.

Not yet brought to Europe.

46. *ANAS SPECULARIS*, King.*Anas specularis*, Sel. et Salv. P. Z. S. 1876, p. 380.*Hab.* Antarctic America.

Not yet brought to Europe alive.

47. *ANAS CRISTATA*, Gm.*Anas cristata*, Sel. et Salv. P. Z. S. 1876, p. 381.*Hab.* Antarctic America.

Not yet imported alive.

Genus *CHAULELASMUS*.48. *CHAULELASMUS STREPERUS* (Linn.). Gadwall Duck.*Chaulelasmus strepera*, Gould, B. G. Brit. v. t. 19.*Hab.* Palearctic Region.

The Gadwall is in our first list, as having been in the Collection in 1830, and usually breeds with us.

*Dates of Hatching of Gadwall Ducks.*

1839. June 30th.	1852. June 14th.
1841. „ 27th.	1853. „ 12th.
1848. „ 21st.	1854. „ 14th.
1850. „ 21st.	1855. July 5th.
1851. May 28th.	„ „ 12th.
„ June 7th.	1856. June 13th.
„ July 8th.	1857. „ 4th.
1852. June 3rd.	1861. „ 20th.



49. CHAULELASMUS COUESI, Streets. Coues's Gadwall.  
*Chaulelasmus couesi*, Streets, Bull. U. S. N. Mus. no. 7, p. 21.  
*Hab.* Fanning Islands, Pacific.  
 Not yet brought alive to Europe.

Genus HETERONETTA.

50. HETERONETTA MELANOCEPHALA (Vieill.). Black-headed Duck.  
*Heteronetta melanocephala*, Scl. et Salv. P. Z. S. 1876, p. 382.  
*Hab.* South America.  
 Not yet introduced.

Genus MARMARONETTA<sup>1</sup>.

51. MARMARONETTA ANGUSTIROSTRIS, Ménétr. Marbled Duck.  
*Anas angustirostris*, Gould, B. Eur. v. t. 373.  
*Hab.* South Europe, North Africa, and Western Asia.  
 I have never seen this Duck in any living collection, though Mr. Bartlett tells me he believes he has seen examples in captivity.

Genus RHODONESSA.

52. RHODONESSA CARYOPHYLLACEA (Latham). Pink-headed Duck.  
*Rhodonessa caryophyllacea*, Gr. et Mitch. Gen. B. t. 167; Scl. P. Z. S. 1874, p. 110; Garrod, P. Z. S. 1873, p. 153.  
*Hab.* India.  
 In 1874 we obtained a pair of this beautiful Indian Duck, which, however, unfortunately did not live long with us.

Genus QUERQUEDULA.

a. *Species Arcticæ.*

53. QUERQUEDULA CIRCIA (Linn.). Garganey Teal.

*Querquedula circia*, Gould, B. G. Brit. v. t. 17.

*Hab.* Europe.

The Garganey is always to be found represented in the Collection, being recorded in the earliest list (1831), the Catalogue of 1849, and the various Lists of Animals (1852-79). It is, however, I consider rather a shy breeder, having only bred twice with us, so far as I can ascertain by our records.

*Dates of Breeding of Garganey Teal.*

1849. June 6th.

|

1859. July 19th.

<sup>1</sup> Reichenb, Syst. Ar. p. ix (1852).

54. *QUERQUEDULA DISCORS* (Linn.). Blue-winged Teal.

*Querquedula discors*, Baird, B. N. A. p. 779; Scl. et Salv. P. Z. S. 1876, p. 383.

*Hab.* Eastern N. America.

Not yet introduced.

55. *QUERQUEDULA CRECCA* (Linn.). Common Teal.

*Querquedula crecca*, Gould, B. G. Brit. v. t. 16.

*Hab.* Palæarctic Region.

In the Gardens since 1830, and a constant breeder.

*Dates of Hatching of Common Teal.*

1839. June 30th.	1855. July 12th.
1843. July 14th.	1856. June 4th.
1844. June 10th.	1860. „ 24th.
1846. „ 9th.	1861. „
1847. July 3rd.	1865. July 6th.
1850. „ 8th.	1876. „ 24th.
1854. June 23rd.	

56. *QUERQUEDULA CAROLINENSIS* (Gm.). Carolina Teal.

*Querquedula carolinensis*, Scl. et Salv. P. Z. S. 1876, p. 385.

*Hab.* North America.

Not yet introduced.

57. *QUERQUEDULA FORMOSA* (Gm.). Japanese Teal.

*Anas formosa*, Temm. et Schl. F. J. Aves, tt. 82 B et 82 c.

“*Anas perpulchra*, Yarr.” Rep. of Council. 1831, p. 22.

*Hab.* North-eastern Asia.

Examples of this beautiful Teal were acquired by the Society in its earliest days; but it did not breed in our Gardens until 1840, although, I believe, it had previously done so at Knowsley. I find the following four instances of young birds hatched in the registers:—

*Dates of Hatching of Japanese Teal.*

1840. July 15th.	1842. July 10th.
1841. „ 15th.	1843. „ 2nd.

The species was subsequently lost and not again acquired, I believe, until 1867, when two pairs were purchased out of a merchant-vessel. We have since obtained additional specimens, but have not yet succeeded in inducing the recent arrivals to breed.

58. *QUERQUEDULA FALCATA* (Pallas). Falcated Teal.

*Querquedula falcata*, Midd. Sib. Reise, t. 21. fig. 2.

*Hab.* N.E. Asia.

Examples of both sexes of this splendid Teal were acquired in 1874, but the species has not yet bred with us.

b. *Species Æthiopicæ.*

59. QUERQUEDULA HARTLAUBI, Cassin. Hartlaub's Teal.  
*Querquedula hartlaubi*, Cassin, Pr. Ac. Sc. Phil. 1859, p. 175.  
*Hab.* West Africa.  
 Not yet introduced.
60. QUERQUEDULA PUNCTATA (Burch.). Hottentot Teal.  
*Querquedula hottentotta*, Smith, Ill. S. Afr. Zool., Aves, t. 105.  
*Anas punctata*, Burchell, Travels, i. p. 283 (1822).  
*Hab.* South Africa.  
 Not yet introduced.

c. *Species Neotropicæ.*

61. QUERQUEDULA CYANOPTERA (Vieill.). Blue-winged Teal.  
*Querquedula cyanoptera*, Baird, B. N. A. p. 780; Scl. et Salv.  
 P. Z. S. 1876, p. 384.  
*Hab.* South America and Western North America.  
 Not yet imported, so far as I know.
62. QUERQUEDULA OXYPTERA (Meyen). Sharp-winged Teal.  
*Querquedula oxyptera*, Scl. et Salv. P. Z. S. 1876, p. 385.  
*Hab.* Andes of Peru.  
 Not yet introduced.
63. QUERQUEDULA FLAVIROSTRIS (Vieill.). Chilian Teal.  
*Querquedula flavirostris*, Scl. et Salv. P. Z. S. 1876, p. 386.  
*Hab.* Antarctic America.  
 Obtained from Chili in 1871, and again in 1874, but has not  
 bred with us.
64. QUERQUEDULA ANDIUM, Scl. et Salv. Andean Teal.  
*Querquedula andium*, Scl. et Salv. P. Z. S. 1876, p. 387.  
*Hab.* Andes of Ecuador and Venezuela.  
 Not yet introduced.
65. QUERQUEDULA VERSICOLOR (Vieill.). Brilliant Teal.  
*Querquedula versicolor*, Scl. et Salv. P. Z. S. 1876, p. 388.  
*Hab.* Antarctic America.  
 Not yet introduced.
66. QUERQUEDULA PUNA (Tsch.). Puna Teal.  
*Querquedula puna*, Scl. et Salv. P. Z. S. 1876, p. 388.  
*Hab.* Andes of Peru and Bolivia.  
 Not yet introduced.
67. QUERQUEDULA TORQUATA (Vieill.). Ringed Teal.  
*Querquedula torquata*, Scl. et Salv. P. Z. S. 1876, p. 389.  
*Hab.* Paraguay and Buenos Ayres.  
 Not yet acquired.

68. *QUERQUEDULA BRASILIENSIS* (Gm.). Brazilian Teal.

*Querquedula brasiliensis*, ScL. et Salv. P. Z. S. 1876, p. 390.

*Hab.* South America.

We received a single example of this pretty Teal in 1864 from Para. In 1873 we obtained a pair in exchange from Mr. Polvliet, of Rotterdam, and soon afterwards other examples. The species did not breed with us until 1878, when two were hatched on June 11th. It bred again last year, when seven were hatched on August 7th.

69. *QUERQUEDULA EATONI*, Sharpe. Eaton's Teal.

*Querquedula eatoni*, Sharpe, Ibis, 1875, p. 328; Phil. Trans. vol. 168, p. 105, pl. vi.

*Hab.* Kerguelen's Land.

#### Genus SPATULA.

70. *SPATULA CLYPEATA* (Linn.). Shoveller.

*Spatula clypeata*, Gould, B. G. Brit. v. t. 14.

*Hab.* Palearctic and Nearctic Regions.

The Shoveller is named in the list of 1831, and breeds readily in ornamental waters.

#### *Dates of Hatching of Shoveller Ducks.*

1845. July 5th.	1859. July 4th.
1846. June 9th.	" " 11th.
1852. July 20th.	1860. June 24th.
1853. June 12th.	1870. July 9th.
1855. July 2nd.	1872. " 8th.
1857. June 30th.	1876. " 10th.

71. *SPATULA CAPENSIS*, Smith. Cape Shoveller.

*Rhynchaspis capensis*, Smith, Ill. S. Afr. Zool., Aves, t. 98.

*Hab.* South Africa.

Not yet introduced.

72. *SPATULA RHYNCHOTIS* (Lath.). Australian Shoveller.

*Spatula rhynchotis*, Gould, B. Austr. vii. t. 12.

*Hab.* Australia.

Not yet introduced.

73. *SPATULA VARIEGATA*, Gould. New-Zealand Shoveller.

*Spatula variegata*, Buller, B. N. Zealand p. 252, t.

*Hab.* New Zealand.

Not yet introduced.

74. *SPATULA PLATALEA* (Vieill.). South-American Shoveller.

*Spatula platalea*, ScL. et Salv. P. Z. S. 1876, p. 396.

*Hab.* Antarctic America.

Not yet introduced.

## Genus MALACORHYNCHUS.

75. MALACORHYNCHUS MEMBRANACEUS, Swains. Membranaceous Duck.

*Malacorhynchus membranaceus*, Gould, B. Austr. vii. t. 13.

*Hab.* Australia.

## Genus METOPIANA.

76. METOPIANA PEPOSACA (Vieill.). Rosy-billed Duck.

*Anas peposaca*, Scl. P. Z. S. 1867, p. 687.

*Metopiana peposaca*, Scl. P. Z. S. 1870, p. 666, t. xxxvii.; Scl. et Salv. P. Z. S. 1876, p. 398.

*Hab.* Antarctic America.

A single male of this beautiful Duck was received in 1867. In 1870 we obtained three pairs from Mr. Weisshaupt's Chilian collections, but they did not breed until 1873.

*Dates of Hatching of the Rosy-billed Duck.*

1873. July 20th.

1874. „ 6th.

1875. September 7th.

1876. July 1st.

1879. „ 11th.

## G. Subfam. VI. FULIGULINÆ.

## Genus FULIGULA.

a. *Species Arcticæ.*

1. FULIGULA RUFINA (Pallas). Red-crested Whistling Duck.

*Branta rufina*, Gould, B. G. Brit. v. t. 22.

*Hab.* South Europe, North Africa, and Western Asia.

We first received a single male of this beautiful Duck from our Corresponding Member Mr. E. C. Buck, in 1874. In 1876 the same gentleman most liberally presented us with twelve males and six females of the same species, obtained in the Punjab.

In spite of every care lavished upon several pairs of this Duck, selected out of the lot thus acquired, they have hitherto refused to reproduce *inter se*. But last year five curious hybrid Ducks were bred in the Society's Gardens, which seem certainly to be the produce of a cross between this species and *Metopiana peposaca*, as examples of these two species were in the pond in which they were hatched, although it is not certainly known of which sex the parents were respectively.

2. FULIGULA CRISTATA (Leach). Tufted Duck.

*Fuligula cristata*, Gould, B. G. Brit. v. t. 23.

*Hab.* Palæarctic Region.

The Tufted Duck occurs in the earliest list (1831), and is a familiar inhabitant of our "Three-island Pond." Up to 1848 it bred pretty regularly in this situation. In 1849 it hybridized with the White-eyed Duck, and the hybrids thus produced continued to breed either *inter se* or with one of the parents until 1861.

*Dates of Hatching of Tufted Ducks.*

1840. July 13th.	1845. June 11th.
1841. June 27th.	" " 17th.
1842. " 19th.	1846. " 7th.
1843. May 30th.	" " 12th.
" June 5th.	1847. " 19th.
" " 11th.	" " 23rd.
1844. " 10th.	1848. " 17th.
" July 29th.	

*Dates of Hatching of hybrid Tufted and White-eyed Ducks.*

1849. June 26th.	1854. July 11th.
" July 20th.	1855. " 2nd.
1850. June 21st.	" " 5th.
1851. July 8th.	" " 22nd.
1853. " 9th.	1857. June 19th.
1854. June 14th.	1859. July 1st.
" " 24th.	" " 4th.
" " 28th.	1861. June 12th.
" July 5th.	

3. *FULIGULA COLLARIS* (Donov.). Ring-necked Duck.*Fuligula collaris*, ScL. et Salv. P. Z. S. 1876, p. 400.*Hab.* North America.

Not yet introduced into European gardens.

4. *FULIGULA MARILA* (Linn.). Scaup Duck.*Fuligula marila*, Gould, B. G. Brit. v. t. 24.*Hab.* Palæarctic and Nearctic Regions.

Exhibited first in 1845 and frequently since, but has not bred in our Gardens. I am not sure that it has ever done so on the Continent.

5. *FULIGULA AFFINIS*, Eyton. American Scaup Duck.*Fuligula affinis*, ScL. et Salv. P. Z. S. 1876, p. 399.*Hab.* Nearctic Region.

Not yet introduced into European waters.

6. *FULIGULA MARILOIDES* (Vigors). Chinese Scaup Duck.*Fuligula mariloides*, Vig. in Beechey's Voy. Zool. p. 31; Swinhoe, P. Z. S. 1873, p. 412.*Hab.* China.

We received three females of this somewhat doubtful species from Mr. Swinhoe in 1873 (see P. Z. S. 1873, p. 312).

7. *FULIGULA FERINA* (Linn.). Red-headed Pochard.*Nyroca ferina*, Gould, B. G. Brit. v. t. 20.*Hab.* Palæarctic Region.

The Pochard occurs in the earliest list (1831). I am not sure

that it has ever bred in our Gardens, but it has done so in other ornamental waters, such as Knowsley and Kew Gardens (1880). Three Pochards bred at Knowsley were sold at the sale in 1851.

8. *FULIGULA AMERICANA*, Eyton. American Pochard.

*Fuligula americana*, Scl. et Salv. P. Z. S. 1876, p. 400.

*Hab.* Nearctic Region.

We have not yet received living examples of this close ally of our Pochard.

9. *FULIGULA VALISNERIA*, Wils. Canvas-backed Duck.

*Fuligula valisneria*, Scl. et Salv. P. Z. S. 1876, p. 400.

*Hab.* Nearctic Region.

Never yet introduced alive into Europe, so far as I know.

10. *FULIGULA NYROCA* (Gould). White-eyed Duck.

*Nyroca leucophthalmos*, Gould, B. G. Brit. v. 21.

*Hab.* Western Palearctic Region.

The White-eyed Duck is an old inhabitant of our Gardens, but does not occur in the first list. I can find no evidence of its having bred pure; but it hybridized in 1851, and some of the following years either with the Pochard or Tufted Duck.

*Dates of Hatching of Cross-bred Castaneous Ducks.*

1851. June 24th.

1856. July 1st.

1855. July 12th.

1860. June 15th.

*b. Species Æthiopicæ.*

11. *FULIGULA CAPENSIS* (Less.). Cape White-eyed Duck.

*Anas capensis*, Less. Tr. d'Orn. p. 632 (1831).

*Nyroca brunnea*, Eyt. Anat. t. 23, p. 161 (1838).

*Hab.* South Africa.

A single female of this little-known Duck was purchased by the Society at the Knowsley sale in 1851, and lived many years in the Gardens.

*c. Species Neotropicæ.*

12. *FULIGULA NATIONI*, Scl. et Salv. Nation's Pochard.

*Fuligula nationi*, Scl. et Salv. P. Z. S. 1877, p. 522; Sclater, P. Z. S. 1878, p. 477, t. xxxii.

*Hab.* Western Peru.

*d. Species Australianæ.*

13. *FULIGULA AUSTRALIS* (Gould). Australian White-eyed Duck.

*Nyroca australis*, Gould, B. Austr. vii. t. 16.

*Hab.* Australia.

Not known alive in Europe.

14. FULIGULA NOVÆ-ZEALANDIÆ (Gm.) New-Zealand Scaup.

*Fuligula novæ-zealandiæ*, Bull. B. N. Zeal. p. 259.

*Hab.* New Zealand.

Not known alive in Europe.

Genus HYMENOLEMUS.

15. HYMENOLEMUS MALACORHYNCHUS (Gm.) Blue Duck.

*Hymenolæmus malacorhynchus*, Bull. B. N. Zeal. p. 262.

*Hab.* New Zealand.

A single example of this rare Duck was obtained from the Acclimatization Society of Melbourne in 1876, but did not live long. (See P. Z. S. 1876, p. 463.)

Genus CLANGULA.

16. CLANGULA GLAUCION (Linn.). Golden-eye.

*Clangula glaucion*, Gould, B. G. Brit. v. t. 31.

*Hab.* Northern Palæarctic and Nearctic Regions.

Exhibited first in 1832 or thereabouts, and frequently obtained subsequently, but has not bred with us, nor, so far as I know, elsewhere in captivity.

17. CLANGULA ISLANDICA (Gm.). Barrow's Golden-eye.

*Clangula islandica*, Elliot, B. N. A. ii. t. xlv.

*Hab.* Iceland and Arctic America.

Not known in captivity.

18. CLANGULA ALBEOLA (Linn.). Buffel-headed Duck.

*Bucephala albeola*, Baird. B. N. A. p. 797.

*Hab.* North America.

Not known in captivity.

Genus COSMONETTA.

19. COSMONETTA HISTRIONICA (Linn.). Harlequin Duck.

*Histrionicus torquatus*, Gould, B. G. Brit. v. t. 32.

*Hab.* Circumpolar regions.

Not known in captivity.

Genus HARELDA.

20. HARELDA GLACIALIS (Linn.). Long-tailed Duck.

*Harelda glacialis*, Gould, B. G. Brit. v. t. 33.

*Hab.* Circumpolar area.

Not known in captivity.

Genus HENICONETTA.

21. HENICONETTA STELLERI (Pallas). Steller's Duck.

*Eniconetta stelleri*, Gould, B. G. Brit. v. t. 25.

*Hab.* North Palæarctic Region and Western America.

Not known in captivity, I believe.



## Genus CAMPTOLEMUS.

22. CAMPTOLEMUS LABRADORICUS (Gm.). Labrador Duck.

*Camptolæmus labradoricus*, Baird, B. N. A. p. 803.*Hab.* Arctic America.

This now extinct bird has never, so far as I know, been captured alive.

## Genus SOMATERIA.

23. SOMATERIA MOLLISSIMA (Linn.). Eider Duck.

*Somateria mollissima*, Gould, B. G. Brit. v. t. 26.*Hab.* Circumpolar area.

Eiders were first obtained by the Society in 1838<sup>1</sup>, and bred several years in the Gardens. They were also in the Knowsley Menagerie. Of late years we have received but few specimens, and they have not bred with us.

*Dates of Hatching of Eider Ducks.*

1841. July 7th.

1849. June 9th.

1848. June 25th.

24. SOMATERIA V-NIGRUM, Gray.

*Somateria v-nigrum*, G. R. Gray, P. Z. S. 1855, p. 211, t. 107; Elliot, B. N. A. t. xlviii.

*Hab.* Arctic America.

Unknown in captivity.

25. SOMATERIA SPECTABILIS (Linn.). King-Duck.

*Somateria spectabilis*, Gould, B. G. Brit. v. t. 27.*Hab.* Circumpolar regions.

Not yet obtained alive, so far as I know.

## Genus LAMPRONETTA.

26. LAMPRONETTA FISCHERI, Brandt. Fischer's Eider.

*Lampronetta fischeri*, G. R. Gray, P. Z. S. 1855, t. 108; Elliot, B. N. A. t. 47.

*Hab.* N.W. America.

Not known in captivity.

## Genus ŒDEμία.

27. ŒDEμία NIGRA, Flem. Black Scoter.

*Oidemia nigra*, Gould, B. G. Brit. v. t. 28.*Hab.* North Palæarctic Region.

The Black Scoter is occasionally obtained alive, but does not do well in captivity.

<sup>1</sup> Rep. Council, 1839, p. 39.

28. *ÆDESMIA AMERICANA*, Sw. American Scoter.

*Edemia americana*, Baird, B. N. A. p. 807.

*Hab.* North America.

Not known in captivity.

29. *ÆDESMIA FUSCA* (Linn.) Velvet Scoter.

*Oidemia fusca*, Gould, B. G. Brit. v. t. 29.

*Hab.* Palæarctic and Arctic Regions.

An example of the Velvet Scoter was obtained from Holland in 1853 (Rep. Council, 1853, p. 16).

30. *ÆDESMIA VELVETINA*, Cassin. American Velvet Scoter.

*Edemia velvetina*, Baird, B. N. A. p. 805.

*Hab.* Northern America.

Not known in captivity.

31. *ÆDESMIA PERSPICILLATA* (Linn.). Surf-Scoter.

*Oidemia perspicillata*, Gould, B. G. Brit. v. t. 30.

*Hab.* North America; rare in Europe.

Not known in captivity, as is also not the American *Æ. trowbridgii*, if distinct.

#### Genus TACHYERES.

32. *TACHYERES CINEREUS* (Gm.). Loggerhead Duck.

*Tachyeres cinereus*, Sc. et Salv. P. Z. S. 1876, p. 482.

*Hab.* Antarctic America.

A single example of this species was received by the Society from Capt. Moore, of the Falklands, in 1861. (See P. Z. S. 1861, p. 367.)

#### H. Subfam. VII. ERISMATURINÆ.

The Lake-Ducks are not facile subjects for domestication, and I am not aware that any of them have yet been introduced into European gardens.

#### Genus BIZIURA.

1. *BIZIURA LOBATA* (Shaw). Musk-Duck.

*Biziura lobata*, Gould, B. Austr. vii. t. 18.

*Hab.* Australia.

#### Genus THALASSORNIS.

2. *THALASSORNIS LEUCONOTA* (Smith). White-backed Lake-Duck.

*Thalassornis leuconota*, Smith, Ill. S. Afr. Zool., Aves, t. 107.

*Hab.* Lakes of South Africa.

## Genus ERISMATURA.

3. ERISMATURA LEUCOCEPHALA (Scop.). White-headed Diving-Duck.

*Erismatura leucocephala*, Gould, B. Eur. vii. t. 383.

*Hab.* S.E. Europe.

4. ERISMATURA MOCOA, Smith. Mocoa Diving-Duck.

*Erismatura mocoa*, Smith, Ill. S. Afr. Zool., Aves, tt. 108, 109.

*Hab.* Lakes of South Africa.

5. ERISMATURA RUBIDA (Wils.). Ruddy Diving-Duck.

*Erismatura rubida*, Scl. et Salv. P. Z. S. 1876, p. 403.

*Hab.* North and Central America.

6. ERISMATURA AUSTRALIS (Gould). Blue-billed Diving-Duck.

*Erismatura australis*, Gould, B. Austr. vii. t. 17.

*Hab.* Australia.

7. ERISMATURA FERRUGINEA, Eyton. Ferruginous Diving-Duck.

*Erismatura ferruginea*, Scl. et Salv. P. Z. S. 1876, p. 404.

*Hab.* Antarctic America.

8. ERISMATURA DOMINICA (Linn.). Dominican Diving-Duck.

*Erismatura dominica*, Scl. et Salv. P. Z. S. 1876, p. 405.

*Hab.* West Indies and Central and South America.

## Genus NESONETTA.

9. NESONETTA AUCKLANDICA, G. R. Gray. Auckland-Islands Diving-Duck.

*Nesonetta aucklandica*, G. R. Gray, Voy. Erebus & Terr., Birds, p. 31, t. xvii.

*Hab.* Auckland Islands.

## I. Subfam. VIII. MERGANETTINÆ.

The Torrent-Ducks of the Andes of South America are allied to the Lake-Ducks and to the Mergansers, but seem to be most naturally arranged as a separate family.

None of the three known species have yet been introduced into living collections.

1. MERGANETTA ARMATA, Gould. Chilian Torrent-Duck.

*Merganetta armata*, Scl. et Salv. P. Z. S. 1876, p. 406.

*Hab.* Rivers of the Andes of Chili.

2. *Merganetta turneri*, ScL. et Salv. Turner's Torrent-Duck.

*Merganetta turneri*, ScL. et Salv. P. Z. S. 1876, p. 407; Ex. Orn. p. 199, t. 100.

*Hab.* Rivers of the Andes of Cuzco.

3. *Merganetta leucogenys* (Tsch.). White-checked Torrent-Duck.

*Merganetta leucogenys*, ScL. et Salv. P. Z. S. 1876, p. 408.

*Hab.* Rivers of the Andes of Columbia, Ecuador, and North Peru.

#### J. Subfam. IX. MERGINÆ.

The Mergansers are not good subjects for our Gardens, requiring supplies of live fishes to keep them in good health. We have occasionally examples of the Goosander, Red-breasted Merganser, and Smew; but they cannot be said to thrive under our treatment.

#### Genus MERGUS.

1. *Mergus merganser* (Linn.). Goosander.

*Mergus castor*, Gould, B. G. Brit. v. t. 34.

*Hab.* Palæarctic and Nearctic Regions.

We received females of the Goosander in 1864, and males in 1865 and 1867; but they have never done well with us.

2. *Mergus serrator*, Linn. Red-breasted Merganser.

*Mergus serrator*, Gould, B. G. Brit. v. t. 35.

*Hab.* Palæarctic and Nearctic Regions.

We obtained two examples of this bird from the Zoological Gardens of Hamburg in August 1866; but one arrived dead and the other did not long survive.

3. *Mergus cucullatus*, Linn. Hooded Merganser.

*Mergus cucullatus*, Gould, B. G. Brit. v. t. 36.

*Hab.* N. America, occasional in Europe.

Not yet obtained alive, so far as I know.

4. *Mergus albellus*, Linn. Smew.

*Mergus albellus*, Gould, B. G. Brit. v. t. 37.

*Hab.* Palæarctic Region.

First exhibited in 1851, according to our records, and since obtained occasionally.

5. *Mergus australis*, Hombr. et Jacq. Antarctic Merganser.

*Merganser australis*, Hombr. et Jacq. Voy. P. S., Ois. t. 31. fig. 2.

*Hab.* Auckland Islands.

Only known, I believe, from the original example in the Paris Museum.

6. *MERGUS OCTOSETACEUS*, Vieill. Brazilian Merganser.*Mergus octosetaceus*, Scl. et Salv. P. Z. S. 1876, p. 409.*Hab.* Interior of Brazil.

Rare even in the best-stocked collections, and not known alive.

## K. CONCLUSIONS AS TO INTRODUCTION.

It would appear, therefore, from the foregoing list (as will be seen more closely by the subjoined summary) that out of about 176 certainly known species of Anatidæ, 94, or more than one half, have been at some time or other acquired in the living state, and shown in zoological gardens or other such places, and that of these 50 have propagated in captivity.

Table I. *Showing the numbers of introduced Anatidæ.*

	Species.		
	Known.	Exhibited.	Bred.
1. Anseranatinæ .....	1	1	...
2. Cereospinæ .....	1	1	1
3. Anserinæ .....	38	25	14
4. Cygninæ .....	10	8	5
5. Anatinæ .....	76	43	25
6. Fuligulinæ .....	32	13	5
7. Erismaturinæ .....	9	...	...
8. Merganettinæ .....	3	...	...
9. Merginæ .....	6	3	...
	176	94	50

## L. REMARKS ON THE GEOGRAPHICAL DISTRIBUTION OF THE ANATIDÆ.

I will conclude with a few remarks upon the geographical distribution of the Anatidæ.

In treating of this part of the subject I find it impossible to separate conveniently the Palæarctic and Nearctic species. So many of the high northern species are circumpolar, or common to both continents, and so many other of the Palæarctic species have closely allied (in some cases barely separable) representatives in the Nearctic area, that it is much more natural to unite these categories into one group as "Arctic Anatidæ." Adding to this the other four generally recognized divisions, we shall find the Anatidæ come out somewhat as follows, in five great geographical groups:—

Table II. *Distribution of the Anatidæ.*

	I. Arctic.	II. Æthio- pian.	III. Indian.	IV. Austra- lian.	V. Neotrop- ical.	Total.
1. Anseranatinae ...	...	...	...	1	...	1
2. Cereopsinae ...	...	...	...	1	...	1
3. Anserinae .....	20	6	1	4	7	38
4. Cygninae .....	7	...	...	1	2	10
5. Anatinae .....	18	13	11	15	24	76 <sup>1</sup>
6. Fuligulinae ...	26	1	...	3	2	32
7. Erismaturinae ...	2	2	...	3	2	9
8. Merganettinae ...	...	...	...	...	3	3
9. Merginae .....	4	...	...	1	1	6
	77	22	12	29	41	176

I will make a few observations on each of these five categories.

### I. ARCTIC ANATIDÆ.

The Arctic Anatidæ are, as will be seen, by far the most numerous, these birds with their thick covering of feathers and aquatic habits being more naturally adapted to cold and watery climates. Out of the 33 known species of Geese 20, out of the 10 known Swans 7, and of the 31 Sea-Ducks not less than 26 belong to this category. Of the whole number of 176 generally recognized species of Anatidæ, 77 may, I think, be best set down as Arctic—although some of them, such as *Tadorna rutila*, *Fuligula rufina*, and *Marmarometta angustirostris*, cannot be strictly so termed, as they inhabit only the temperate portions of the Palæarctic Region. Very many of the Palæarctic species also, as will be noted below, go far south in winter, and intrude far into the Æthiopian, Indian, and Neotropical Regions.

The generic forms restricted to the Arctic area are not numerous, except among the Fuligulinae, where out of 11 known genera (as will be seen by the subjoined Table), 8 are not met with elsewhere. Amongst the Anatinae, *Aix* only is peculiarly Arctic.

Table III. *Distribution of Fuligulinae.*

	Arctic.	Æthio- pian.	Austra- lian.	Neotrop- ical.	Total.
1. Fuligula .....	10	1	2	1	13
2. Hymenolæmus ...	...	...	1	...	1
3. Clangula .....	3	...	...	...	3
4. Cosmonetta .....	1	...	...	...	1
5. Harelda .....	1	...	...	...	1
6. Heniconetta ...	1	...	...	...	1
7. Campistolæmus...	1	...	...	...	1
8. Somateria .....	3	...	...	...	3
9. Lampronetta ...	1	...	...	...	1
10. Oedemia .....	5	...	...	...	5
11. Tachyeres .....	...	...	...	1	1
	26	1	3	2	31

<sup>1</sup> Certain species of Anatinae occur in more than one of the regions; so that the total of species is in this case less than the sum of its constituents.

## II. ÆTHIOPIAN ANATIDÆ.

Under this head I place only those species that live all the year round and breed within the region. These are about 22 in number, as given in the following list :—

*List of Æthiopian Anatidæ.*

<i>Plectropterus gambensis.</i>	<i>Tadorna cana.</i>
—— <i>rueppelli.</i>	<i>Dafila erythrorhyncha</i> <sup>2</sup> .
—— <i>niger.</i>	<i>Anas melleri</i> <sup>1</sup> .
<i>Chenalopex ægyptiaca.</i>	—— <i>xanthorhyncha.</i>
	—— <i>sparsa.</i>
<i>Bernicla cyanoptera.</i>	—— <i>bernieri</i> <sup>1</sup> .
<i>Nettopus auritus</i> <sup>2</sup> .	<i>Querquedula hartlaubi.</i>
	—— <i>punctata</i> <sup>2</sup> .
<i>Dendrocygna viduata</i> <sup>2</sup> .	<i>Spatula capensis.</i>
—— <i>major</i> <sup>2</sup> .	<i>Fuligula capensis.</i>
—— <i>arcuata.</i>	<i>Thalassornis leuconota</i> <sup>2</sup> .
<i>Sarcidiornis africana</i> <sup>2</sup> .	<i>Erismatura mocoa.</i>

Amongst these are two generic forms not found elsewhere, *Plectropterus* and *Thalassornis*. Of the nine Anatidæ hitherto registered as met with in Madagascar, two species only are peculiar to the island, *Anas melleri* and *A. bernieri*, the remaining seven being also found in Africa.

In winter many of the Palæarctic Anatidæ descend far into Eastern Africa. Heuglin includes *Anser albifrons*, *Bernicla brenta*, *Cygnus olor* and *C. musicus*, *Mareca penelope*, *Dafila acuta*, *Anas boschas*, *Querquedula circia* and *Q. crecca*, *Chaulelasmus streperus*, *Spatula clypeata*, *Fuligula cristata*, *F. marila*, *F. ferina*, and *F. nyroca*, *Clangula glaucion*, *Edemia fusca*, and *Mergus serrator* under this category; while *Tadorna vulpanser* and *T. rutila*, and probably also *Marmaronetta angustirostris* and *Fuligula rufina*, breed in Egypt.

## III. INDIAN ANATIDÆ.

In this category again I include only species that are permanent inhabitants of some part of the region. They are not numerous, consisting only of twelve species :—

<i>Nettopus coromandelianus.</i>	<i>Tadorna scutulata.</i>
<i>Sarcidiornis melanota.</i>	<i>Anas luzonica.</i>
<i>Dendrocygna guttulata.</i>	—— <i>pæcilorhyncha.</i>
—— <i>major.</i>	—— <i>zonorhyncha.</i>
—— <i>arcuata.</i>	—— <i>gibberifrons.</i>
—— <i>vagans.</i>	<i>Rhodonessa caryophyllacea.</i>

Amongst these there is only one peculiar generic form, *Rhodonessa*.

In winter, however, a host of immigrants from the north invade the Indian Region. Jerdon gives us accounts of upwards of twenty

<sup>1</sup> Peculiar to Madagascar.

<sup>2</sup> Also found in Madagascar.

northern Ducks and Geese which are found in various parts of the Indian peninsula in the cold weather.

#### IV. AUSTRALIAN ANATIDÆ.

As we advance further south the Anatidæ commence to increase again. Instead of only 12 native species, we find the number running up to 29. The greater number of them are Australian, that great continent, although so dry and arid, being well supplied with water-fowl, as will be seen by the subjoined list.

##### *List of Australian Anatidæ.*

<i>Anseranas melanoleuca.</i>	<i>Tadorna tadornoides.</i>
<i>Cereopsis novæ-hollandiæ.</i>	<i>Stictonetta nævosa.</i>
<i>Bernicla jubata.</i>	<i>Anas superciliosa.</i>
<i>Nettopus albigennis.</i>	—— <i>castanea.</i>
—— <i>pulchellus.</i>	—— <i>gibberifrons.</i>
<i>Cygnus atratus.</i>	<i>Spatula rhynchotis.</i>
<i>Dendrocygna vagans.</i>	<i>Malacorhynchus membranaceus.</i>
—— <i>eytoni.</i>	<i>Fuligula australis.</i>
<i>Tadorna radjah.</i>	<i>Biziura lobata.</i>
	<i>Erismatura australis.</i>

Among these there are no less than 5 generic monotypic types peculiar to the Australian Region—namely, *Anseranas*, *Cereopsis*, *Stictonetta*, *Malacorhynchus*, and *Biziura*.

Proceeding to the outlying parts of the Australian Region, we find New Zealand also well provided with Anatidæ. Dr. Buller comprehends the following 9 species in his excellent work :—

<i>Dendrocygna eytoni.</i>	* <i>Spatula variegata.</i>
* <i>Tadorna variegata.</i>	<i>Fuligula australis.</i>
<i>Anas superciliosa.</i>	*—— <i>novæ-zealandiæ.</i>
*—— <i>chlorotis.</i>	* <i>Hymenolæmus malacorhynchus.</i>
—— <i>gibberifrons.</i>	

Of these, however, *Anas gibberifrons* and *Dendrocygna eytoni* are only occasional visitants, and *Anas superciliosa* and *Fuligula australis* are likewise Australian. The remaining five (marked \*) are peculiar to the island, and *Hymenolæmus* is a generic type not known elsewhere.

The adjacent Auckland Islands are tenanted by two very peculiar Ducks quite unknown elsewhere, namely, *Nesonetta aucklandica* and *Mergus australis*.

In Polynesia Anatidæ are scarce, *Dendrocygna vagans* and *Anas superciliosa* being the only species known until we come to the Fanning group, where *Chaulelasmus couesi* has lately been discovered.

In the Sandwich Islands two peculiar species occur, *Bernicla sandwicensis* and *Anas wyvilliana*.



## V. NEOTROPICAL ANATIDÆ.

The Neotropical Region is better supplied with Anatidæ than any other of the divisions here adopted except the Arctic, 39 species being specially attributable to it. Besides these, as Mr. Salvin and I have shown in our article on the Neotropical Anatidæ, published in the Society's 'Proceedings' for 1876<sup>1</sup>, 23 of the Arctic Anatidæ are more or less regular visitants to it during the winter season.

The generic types of Anatidæ restricted to the Neotropical area are 5, namely, *Cairina*, *Heteronetta*, *Metopiana*, *Tachyeres*, and *Merganetta*. There are, however, only 7 species belonging to these peculiar genera; so that the mass of the Neotropical Anatidæ belong to Arctic genera.

On the whole, the Neotropical Anatifauna (if such an expression is allowable) is not more peculiar than that of Australia, where there are also 5 special generic types not found elsewhere. In true Anatidæ the Neotropical Region is specially rich, possessing 23 species against the Arctic 18, as will be seen better by the subjoined Table.

Table IV. *Distribution of Anatinae.*

Genus.	Arctic.	Æthio- pian.	Indian.	Austra- lian.	Neotro- pical.	Total.
1. <i>Dendrocyena</i> .....	...	3	4	2	5	10 <sup>2</sup>
2. <i>Sarcidiornis</i> .....	...	1	1	...	1	3
3. <i>Cairina</i> .....	...	...	...	...	1	1
4. <i>Tadorna</i> .....	2	1	1	3	...	7
5. <i>Stictonetta</i> .....	...	...	...	1	...	1
6. <i>Aix</i> .....	2	...	...	...	...	2
7. <i>Mareca</i> .....	2	...	...	...	1	3
8. <i>Dasila</i> .....	1	1	...	...	2	4
9. <i>Anas</i> .....	2	4	4	5	2	16 <sup>2</sup>
10. <i>Chaulelasmus</i> .....	1	..	...	1	...	2
11. <i>Heteronetta</i> .....	...	...	...	...	1	1
12. <i>Marmaronetta</i> .....	1	...	...	...	...	1
13. <i>Rhodonessa</i> .....	...	...	1	...	...	1
14. <i>Querquedula</i> .....	6	2	...	...	8	16
15. <i>Spatula</i> .....	1	1	...	2	1	5
16. <i>Malacorhynchus</i> ...	...	...	...	1	...	1
17. <i>Metopiana</i> .....	...	...	...	...	1	1
	18	13	11	15	23	75

In Fuligininæ, on the other hand, it is very poor (see Table III. p. 533), having only 1 species against the Arctic 26.

<sup>1</sup> "Revision of the Neotropical Anatidæ," P. Z. S. 1876, p. 358.

<sup>2</sup> In these genera some of the species occur in more regions than one, so that the total is not equal to the sum of the constituents.

November 16, 1880.

Prof. Huxley, F.R.S., Vice-President, in the Chair.

The Secretary read the following reports on the additions made to the Society's Menagerie during the months of June, July, August, September and October 1880 :—

The total number of registered additions to the Society's Menagerie during the month of June was 197, of which 30 were by birth, 93 by presentation, 58 by purchase, 8 were received on deposit, and 8 by exchange. The total number of departures during the same period by death and removals was 99.

The most noticeable additions during the month of June were as follows :—

1. A male Leonine Monkey (*Macacus leoninus*) from Arracan, received in exchange, June 14th, from the Zoological Gardens of Calcutta. This rare Monkey agrees well with the excellent figure by Mr. Wolf (P. Z. S. 1870, p. 664, pl. xxxv.) taken from our former individual of this species.

2. A Tufted Umbre (*Scopus umbretta*) from Africa, purchased June 26th, being the first example of this peculiar African form that has reached us.

The registered additions to the Society's Menagerie during the month of July were 192 in number; of these 101 were acquired by presentation, 22 by purchase, 5 by exchange, 22 by birth, and 42 were received on deposit. The total number of departures during the same period by death and removals was 109.

The most noticeable additions during the month were a pair of Ocellated Turkeys (*Meleagris ocellata*) from Yucatan, presented by Mr. W. E. Sibeth, July 20th.

The acquisition of a pair of this beautiful species is of great interest, as we have had no pure-bred specimens of it in the Gardens since 1864.

The total number of registered additions to the Society's Menagerie during the month of August was 113; of these 42 were acquired by presentation, 45 by purchase, 2 by birth, 23 were received on deposit, and 1 in exchange. The total number of departures during the same period by death and removals was 114.

The most noticeable additions during the month were :—

1. A pair of Tcheli Monkeys (*Macacus tcheliensis*) presented by Dr. S. W. Bushell, C.M.Z.S., of H.B.M. Legation, Peking, and received August 17th.

The following is an extract from Dr. Bushell's letter, dated Peking, 17th January, 1880, referring to these animals :—"I have a living specimen of a Monkey which I believe has not yet reached Europe and I shall be happy to present it to the Society if I am assured

it will be acceptable. It is a male of the *Macacus tcheliensis* of A. Milne-Edwards (Recherches pour servir à l'hist. nat. des Mammif. p. 227, pls. 32, 33; A. David, Journ. N.C. B. R. As. Soc. 1873, p. 230; 'Journ. de mon troisième voyage,' 1875, i. p. 42). It was obtained by me from the Yung-ling, or Eastern Mausoleum of the reigning Manchu dynasty, situated about 70 li from Peking, in latitude  $40^{\circ}$  N. It is covered with a thick fur, fitted to endure the bitterly cold winter of this part of North China, where the thermometer goes down to  $10^{\circ}$  below zero.

"I hope to get also the female of the same species, to accompany this specimen, which is a male just over a year old".

In a subsequent communication (dated June 1st, 1880) Dr. Bushell informed me that he had succeeded in obtaining also a female of this Macaque, and had brought the pair with him as far as Shanghai. They have now arrived in the Gardens in good health and condition. *Macacus tcheliensis* evidently belongs to the section of the group allied to *M. rhesus*, but has a shorter tail, shorter and thicker fur, and is generally of a more rufous colour.

2. A male specimen of Michie's Tufted Deer (*Elaphodus michianus*), from China, purchased August 25th.

This is the fourth example of this little-known ruminant which we have received.

3. A young pair of Koodoos (*Strepsiceros kudu*), purchased August 26th. The acquisition of this young pair of animals is very acceptable, as, having now a male and two females in good health and condition, we have every prospect of inducing this fine Antelope to breed in the Gardens.

The total number of registered additions to the Society's Menagerie during the month of September was 87; of these 34 were acquired by presentation, 25 by purchase, 16 were bred in the Gardens, and 12 were received on deposit. The total number of departures during the same period by death and removals was 92.

The total number of registered additions to the Society's Menagerie during the month of October was 109, of which 1 was by birth, 42 by presentation, 37 by purchase, 3 were received in exchange, and 26 on deposit. The total number of departures during the same period by death and removals was 99.

The most noticeable additions during the month were:—

1. A pair of Gayals (*Bibos frontalis*), from the hills of Chittagong, received in exchange from the Zoological Gardens of Calcutta.

2. A pair of young Polar Bears (*Ursus maritimus*), twins, caught in Eira Harbour, N. lat.  $80^{\circ} 5'$  and E. long.  $48^{\circ} 35'$ , and presented to the Society by Mr. B. Leigh Smith, F.Z.S.

3. An Ivory Gull (*Larus eburneus*), also from an island in the Polar Seas, in N. lat.  $80^{\circ} 4'$ , E. long.  $53^{\circ} 5'$ , and presented by the same donor, being the first example of this species that has reached us.

4. An Indian Jerboa (*Alactaga indica*), obtained in May last, in

the Logar valley between Kabul and Guzni, and presented to the Society by Major W. E. Money.

Major Money has kindly favoured me with the subjoined notes upon this interesting animal, which is new to the Society's Collection:—

"I had at first a pair of these Jerboas: they were caught at His-sarak, in the Logar valley, between Kabul and Guzni, about 40 miles from Kabul. When I first caught them, in May last, though the weather was not then very cold, I once or twice found them in the morning quite stiff from the cold, and had to revive them by putting the box in the sun. I took to filling their box with cotton-wool; but this did not answer, as I found their legs got tightly entangled in it; so I used sheep's wool chopped short, and soon found that the little captives appreciated a comfortable berth.

"The Jerboa lives in holes in the ground at all seasons, as far as I could ascertain. It is not often seen in the day, feeds at night on all kinds of grain, does not appear to require water in its natural state: but in the excessive heat on the march from Kabul (up to 115° in tents) I believe that without it my specimens would have died; for they would drink from a tea-spoon at all times.

"The second, which was a young male, was well and healthy, but could not stand the heat, and died at Peshawur when all its worst troubles were over. I had been told that I should never succeed in landing them in England; and had they not shared my umbrella, I think this would have been the case. I fed them on green wheat, green rice, indian corn, lucerne, raw potatoes and gram and other grain and dry biscuit."

Mr. Selater laid upon the table a skin of the beautiful Guinea-fowl from Zanzibar lately described by Mr. Bartlett (P. Z. S. 1877, p. 652, pl. lxxv.) as *Numida ellioti*, of which the Society had recently received several living examples.

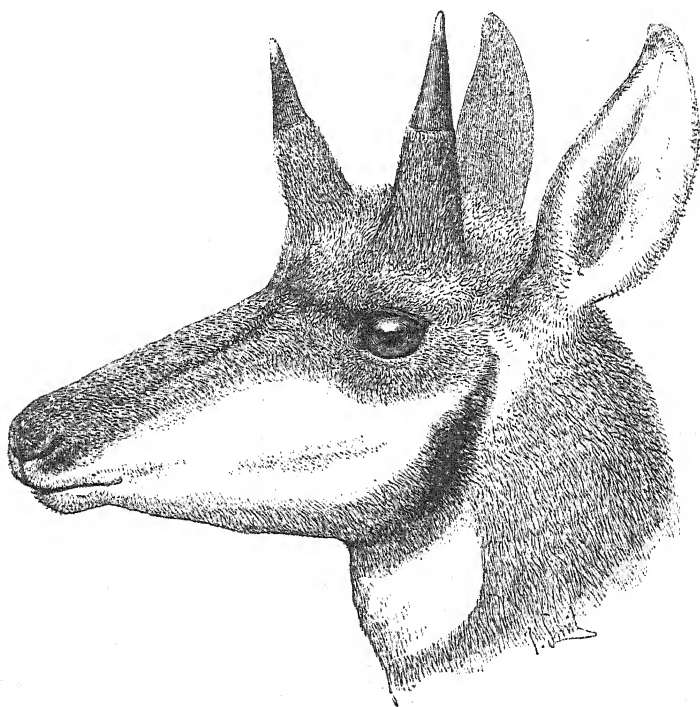
Dr. Cabanis, to whom the skin in question had been forwarded for comparison, had declared it to be the same as *Numida pucherani*, Hartlaub (J. F. O. 1860, p. 341); and Mr. Selater was inclined to agree with this view. It was evident that Mr. Bartlett had been misled by the inaccurate colouring of the head given in Mr. Elliot's figure of *Numida pucherani* (Monogr. Phasian. vol. ii. pl. xlv.), in which the whole side of the head is coloured blue instead of red, as accurately represented in Mr. Bartlett's figure.

Mr. G. E. Dobson exhibited the head of a Partridge shot by Mr. C. W. Griffith at Ashley, near Stockbridge, in which excessive growth of the intermaxillary bones had caused the upper mandible to project nearly half its entire length beyond the lower. The palatine bones were normal; and no trace of previous injury to the beak, which might account for the excessive growth, could be traced.

Mr. W. A. Forbes exhibited some drawings of the horns of the Prongbuck (*Antilocapra americana*), and made the following remarks:—

“Many of those here present tonight will doubtless remember the surprise created amongst naturalists by Mr. Bartlett’s announcement, in 1865, of the shedding of the horns of the Prongbuck. The first surprise that this statement created having passed away, the deciduous nature of the horns of *Antilocapra americana* seemed in a fair way of being accepted as one of the commonplaces of zoology.

Fig. 1.



Head of Prongbuck, showing the new pair of horns the day after the shedding of the old ones: reduced.

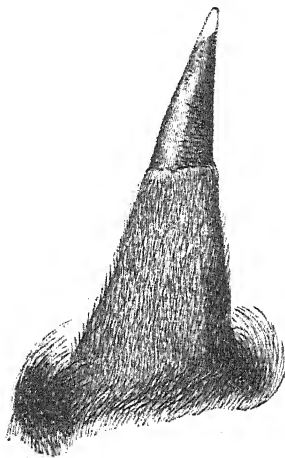
About two years ago, however, the celebrated American zoologist Prof. F. D. Cope appended the following editorial note to a short account of this animal published in the ‘American Naturalist’ (xii. 1878, p. 557) by a Mr. F. W. Endlich:—‘After several years’ familiarity with the Prong-horned Antelope in a wild state, I may say I have never met with an undoubted case of shedding of the horn-sheath. Shed horn-sheaths are not common where these

animals abound, as they would be were the phenomenon usual. Their appearance on the animal at times indicate that they may be shed; and I suppose the evidence is sufficient that the shedding occurs. *But it is not periodical, or even frequent.*

"Fortunately, we have not had long to wait before being able to again test the accuracy of Mr. Bartlett's original position.

"On December 4, the Society purchased a pair of Pronghorns, the male of which was nearly or quite adult, and had 'apparently lately shed his horns, as the pair which he bears were quite soft when he arrived' (cf. P. Z. S. 1880, p. 23). In confirmation of this, Mr. Bartlett tells me that his horns also had then no trace of the 'prong,' which subsequently grew in the ordinary position. Our male animal lived in good health and condition through the summer, and grew a good (though by no means large) pair of horns.

Fig. 2.



Horn of Prongbuck, drawn the day after the shedding of the old horns :  
 $\frac{1}{2}$  nat. size.

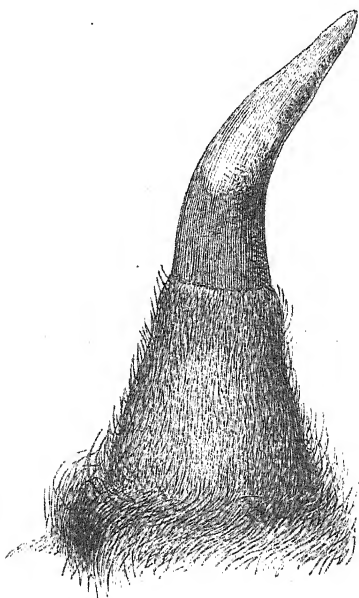
"During the night of October 18-19th last, these horns were shed; but no trace of them could be found, after the most careful search; so that in all probability they were either devoured by the animal itself, or carried away by some predatory rat, or visitor!

"Mr. Smit's drawings that I now exhibit were made on the spot, under my supervision, the day after the shedding (October 20).

"Fig. 1 shows the general form and size of the new horns. From it it is obvious that any person who was not acquainted with the mature horns of the animal would not for a moment suspect that any shedding had taken place. Fig. 2 shows one of the new

horns, drawn of half the natural size, so far as the movements of the animal allow this to be done. The base of the newly uncovered horn is thicker and larger than the top part, and is of a different texture, being greyer and pretty thickly covered with long, whitish, closely appressed hairs. The integument is rather soft and decidedly warm to the touch; and growth is evidently going on here at a rapid pace. The top part, about one inch long, is smoother and blacker, though nearly white at the tip. It is nearly glabrous, with only a very few small hairs, and has the appearance and touch of ordinary horn. It is separated from the basal 'pedicel' part by a slight constriction, and is *movable* on this part in a slight degree from side to side.

Fig. 3.



Horn of Prongbuck, one month after the shedding of the old horns :  
 $\frac{1}{2}$  nat. size.

"Fig. 3 shows the condition of the horns today (November 16), exactly four weeks after the shedding took place. As will be seen, the horns have grown rapidly, and have already acquired a characteristic inward curve. The hair-covered 'pedicel' and the black apical part still retain their original character unaltered; and all the increase of length in the horn is due, as far as I can make out, to the lengthening-out of the 'node' (to use a botanical term), which is marked off as a slight constriction on the fresh horn (vide fig. 2).

The horn above the 'pedicel' is still slightly movable on this latter part, which is still markedly warm to the touch, particularly in its upper half, just below the annular constriction which separates the two parts of the horn. It is here, I am inclined to believe, that the new formation of horn is going on, the apical, harder part being pushed, by the growth of new matter, further and further away from the pedicel. I may add that the 'snag' or 'prong' is not yet visible, but may be felt as a slight eminence at the base of the 'pedicel,' close to the skull, on the anterior margin of the horn.

"On making a longitudinal vertical section of a horn of *Antilocapra*, I find that there is a more or less open canal in the substance of the horn, continued for nearly the whole extent of the main part of the horn, but considerably nearer its posterior than its anterior margin. In its upper part are still observable minute blood-vessels, which have become naturally injected. The horn has obviously been formed around this dermal papilla, which, whilst the surrounding parts have become hard and corneous, has remained soft and vascular for a while; but eventually its tissues have shrivelled up. It will be readily understood how in this way the papilla has gradually been converted into a hollow channel by the growth and elongation of the horn formed originally round it.

"In conclusion, I can only express my surprise that Prof. Cope has apparently overlooked Judge Caton's excellent chapter on the Prongbuck in his 'Antelope and Deer of America' (1877). Judge Caton himself has apparently witnessed the phenomenon several times; and his account of the growth of the horns (pp. 25-35) agrees very well with my own observations, excepting as regards the point of origin of the 'prong.' If the shedding of the horns is 'not periodical or even frequent,' it is certainly strange that both his and the Society's specimens should all have exhibited it. I may remark that the period of the year assigned for shedding the horns by Mr. Caton also quite corresponds with the dates of shedding here (November 7 and October 19)."

[P.S. To-day (Dec. 2) the "prong" is still concealed beneath the hairy covering of the pedicel, but is now very easily perceptible to the touch. The hairy covering of the "pedicel" is thicker now than six weeks ago, apparently owing to the growth of new hairs round it. The horn above is still movable on the "pedicel."—W. A. F.]

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Mr. J. E. Harting, F.Z.S., exhibited and made remarks on a specimen of Bartram's Sandpiper (*Actiturus bartramius*), which had been purchased freshly killed in Leadenhall Market. Mr. Harting had made searching inquiries as to the origin of this specimen, which had resulted in the conclusion that it had been killed in Lincolnshire. Mr. Rye had examined the fragments of Coleoptera contained in the stomach, and believed them to be referable to British species.

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Mr. W. K. Parker read the following abstract of a memoir on the development of the skull in the Urodele Batrachians.

"In the present paper I have worked out the skulls of:—

"1. The Giant Salamander (*Sieboldia maxima*) (adult).

"2. The Menopoma (adult).

"3. *Siren lacertina* (adult and young).

"4. In the native Newts (*Triton cristatus* and *Lissotriton punctatus*), several stages, including the adult.

"These latter I have found to be extremely instructive, as they show in their various stages that which is permanent in the skulls of the larger but lower types.

"The skull of the Great Salamander has been figured before (by Temminck and Schlegel, Wiedersheim, &c.), but never to my satisfaction; and the specimen which lived so long in the Gardens of the Society was evidently larger and older than those dissected and figured by the authorities above mentioned. The types of Urodeles worked out by Wiedersheim and me are now very numerous; and if any one curious in such matters will read and compare what we have written and illustrated, I am confident that he will find that this field has been cultivated, relatively to its extent, as carefully and as neatly as any that can be mentioned.

"But Prof. Huxley's paper on *Menobranchus*, published in the Proceedings of the Society in 1874 (March 17), remains for all time the model 'headland' for all such husbandry: to it, and to the more general account of the Urodeles in his article on the *Amphibia* in the new edition of the 'Encyclopædia Britannica,' I am greatly indebted.

"I am satisfied that this group is extremely well worth all the labour that has been spent upon it, from time to time, by many workers, and that there is in it still much land to be possessed.

"We have no such *persistently larval* forms in the 'Anura' as we have in this group, where all the forms of the larger and lower 'Proteïdea' can have their counterparts shown in the developing series of the young of any of the higher and smaller (Caducibranchiate) types.

"The indefiniteness of the boundary line between the Proteïdea and the Salamandroids is of extreme interest; and this is heightened by the well-known facts of the variable metamorphosis of the Axolotl (*Siredon*) and of what can be done in the way of altering the time of metamorphosis in the *viviparous* Salamander, which, as a rule, absorbs its gill-tufts before it is born.

"Morphologically, the interest of this group is unsurpassable; here for the first time we meet with the rudiments of structures that go on unto perfection in the ascending scale of types.

"Amongst these I may mention the cartilaginous larynx, and the stapes and columella (the outworks of the ear), the latter being formed of a half-aborted or arrested or partly absorbed element that belongs to the hyoid arch.

"In these forms we see the very simple bony plates and cartilages of the larva that correspond with what we find in those very genera-

lized fishes the 'Dipnoi' (*Lepidosiren* and *Ceratodus*), becoming greatly modified, cut up into separate parts, with most diverse modifications and uses.

"Indeed the loss of the gills and the full development of the lungs in these forms is correlated with many other excellencies and accomplishments in these creatures, which make them the forerunners and prophets of the still more excellent types that rise, group above group, in the ascending scale of the Vertebrata

"I know full well that the tailless Amphibia form a nobler group than this, with richer endowments and clearer prophecies; but they spring from another root-stock, and look upwards towards another culmination.

"In these, the Anura, we have, so to speak, the 'primæ lineæ' of the *Mammalia*; we see the 'members' of the *Sauropsida* written in legible characters in the unfolding scroll of the 'Urodeles.'

"In conclusion, I have to thank Dr. Sclater and the President for much of the invaluable materials for this paper, and to express a hope that the Members of the Society will not be slow to receive and put value upon any honest work that explains the morphological meaning of this or that type, or group of types, of the Vertebrata."

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The following papers were read:—

1. On the Palearctic and Æthiopian Species of *Bufo*. By G. A. BOULENGER, Aide-Naturaliste at the Royal Museum of Belgium. (Communicated by Dr. A. GÜNTHER.)

[Received August 3, 1880.]

(Plates L.-LII.)

The present monograph I had undertaken a year ago in collaboration with my friend M. Lataste of Paris, who, after having worked at it during several months, has given it up, being obliged to attend to other studies. He had collected a good deal of information, and he has been so kind as to give me the free use of all his notes concerning this subject.

The African species of the genus *Bufo* have been but little studied, and their synonymy is in a state of great disorder; species which are evidently identical have been separated, whilst others quite distinct have been united. This is the reason that induced M. Lataste and myself to undertake this study. But as the species of the Æthiopian and Palearctic regions are very closely allied, we thought it necessary to extend our investigations to both regions—especially as the variations that some of the Palearctic species undergo have not yet been noticed by authors, and as, at present, even in the most important collections, these species are not always properly distinguished.

The chief condition for doing useful work was to examine the types of all the species. I am glad to say that, in this respect, we have been perfectly successful. The species of nearly all the large collections of Europe have been examined by us. M. Lataste has received, through the kindness of Prof. Schlegel, Dr. Steindachner, and M. Coulon, communication of the African *Bufo*es of the museums of Leyden, Vienna, and Neuchatel. Both of us have studied all the specimens in the Paris Museum; and Prof. Vaillant has kindly communicated to me in Brussels the most interesting forms of that rich collection. Prof. Cornalia has sent me all the African specimens of the Milan Museum; and Dr. Strauch has supplied me with very numerous specimens of *Bufo viridis* from various parts of Asia. Dr. Günther has allowed me to study the specimens in the British Museum. I beg these learned gentlemen to receive my sincere thanks. Finally, I have had at my disposal the collection of the Brussels Museum and that of M. Lataste, which he has most liberally communicated to me.

Thus, this monograph is based upon:—all the specimens of the British, Paris, and Brussels Museums, and M. Lataste's private collection; all the African specimens of the Leyden and Milan Museums; many interesting specimens of the Vienna, St. Petersburg, and Neuchatel museums.

The genus *Bufo*, as understood by me, corresponds to the family Bufonidæ of Dr. Günther, and includes the genera *Schismaderma*, *Bufo*, and *Otilophus*. The first two are the only genera represented in the two regions above mentioned. I admit ten species—four in the Palearctic region, five in the Æthiopian, and one (*Bufo viridis*) inhabiting both regions.

The chief characters I have used for distinguishing these species differ in some respects from those hitherto employed. Such is that taken from the subarticular tubercles under the toes, which in some species are in a single and in others in two rows. This character I have found to be quite constant in all the species but one (*Bufo angusticeps*); and it has been of great help to me in a group where the forms are so closely allied and difficult to distinguish specifically. Another good character, but which cannot be used in very young specimens, exists in the relative size of the tympanum. I have paid but little attention to the size and shape of the parotoid glands, as I am convinced that they do not afford any good specific characters, being subject to considerable variation.

Whenever I have been able to examine the skeleton of a species, I have given a short account of it, restricted to those characters only that are of some interest as distinguishing the species.

By the following dichotomical key I have tried to facilitate the determination of the species; I must say, however, that it can only be applied with security to specimens which are adult, or nearly so.

1. Subarticular tubercles under the toes in a single row ..... 5.
- Subarticular tubercles in two rows (most of them) ..... 2.
- 2. First finger not extending beyond second ..... 4.
- First finger extending beyond second..... 4. *B. mauritanicus*.

- |   |                            |
|---|----------------------------|
| 3. Parotoids black-edged; interorbital space as broad as the upper eyelid.....                    | 8. <i>B. vulgaris</i> .    |
| Parotoids not black-edged; interorbital space narrower than the upper eyelid .....                | 4.                         |
| 4. A parotoid-like gland on the upper side of the calf; belly entirely granulate .....            | 1. <i>B. calamita</i> .    |
| No large gland on the calf; belly almost entirely smooth .....                                    | 6. <i>B. angusticeps</i> . |
| 5. First finger not extending beyond second .....   | 6.                         |
| First finger extending beyond second .....  | 7.                         |
| 6. A parotoid-like gland on the upperside of the calf; belly entirely granulate .....             | 2. <i>B. raddei</i> .      |
| No large gland on the calf; belly almost entirely smooth .....                                    | 6. <i>B. angusticeps</i> . |
| 7. Parotoids flat, indistinct .....   | 7. <i>B. carens</i> .      |
| Parotoids distinct .....  | 8.                         |
| 8. A cutaneous tarsal fold .....  | 9.                         |
| No tarsal fold .....  | 10.                        |
| 9. Tympanum not more than half the size of the eye; first finger not much longer than second..... | 3. <i>B. viridis</i> .     |
| Tympanum nearly as large as the eye; first finger much longer than second .....                   | 5. <i>B. regularis</i> .   |
| 10. Tympanum distinct .....   | 9. <i>B. tuberosus</i> .   |
| Tympanum hidden.....  | 10. <i>B. taitanus</i> .   |

### 1. *BUFO CALAMITA*, Laurenti.

*Bufo terrestris fetidus*, Rösel, Hist. Ran. p. 107, pl. 24 (1758).

*Bufo calamita*, Laurenti, Syn. Rept. p. 27, pl. i. f. 1 (1768); Daudin, Hist. Ran. Gren. Crap. p. 77, pl. 28. f. 1 (1802); Daudin, Hist. Rept. viii. p. 153 (1803); Bonaparte, Faun. Ital. (1832); Bell, Brit. Rept. p. 116 (1839); Günther, Cat. Batr. Sal. p. 57 (1858); Fatio, Vert. Suisse, iii. p. 402 (1872); Schreiber, Herp. Eur. p. 141 (1875); De Betta, Faun. Ital. Rett. Anf. p. 75 (1875); Lataste, Herp. Gir. p. 291 (1876); Leydig, An. Batr. p. 36 (1877).

*Bufo cruciatus*, Schneider, Hist. Amph. f. i. p. 193 (1799).

*Bufo cursor*, Daudin, Hist. Rept. viii. p. 164 (1803).

*Bufo viridis*, part., Duméril & Bibron, Erp. Gén. viii. p. 681 (1841).

*Characters*.—Crown of the head without bony ridges. Snout short, blunt. Interorbital space narrow. Tympanum small, round, rather indistinct. Parotoids small, oval, or subtriangular, depressed. Fingers short, with two-rowed subarticular tubercles; first not extending beyond second. Hind limbs short; a parotoid-like gland on the calf; a cutaneous fold along the inner edge of the tarsus; toes short, webbed at the base, with the subarticular tubercles in two rows. Upper parts with irregular, depressed, distinctly porous warts. Olive-marbled or spotted above, generally a yellow vertebral line; beneath whitish, more or less black-spotted. Male with a much developed subgular vocal sac.

*Dimensions.*

	<i>a.</i>	<i>b.</i>	<i>c.</i>	<i>d.</i>
	m.	m.	m.	m.
From snout to vent .....	0·074	0·080	0·048	0·044
Length of head.....	0·019	0·018	0·013	0·014
Breadth of head .....	0·023	0·024	0·017	0·017
From eye to nostril .....	0·004	0·0045	0·003	0·003
From eye to tip of snout.....	0·010	0·010	0·007	0·007
Greatest diameter of orbit ...	0·007	0·007	0·0055	0·0055
Interorbital space.....	0·0045	0·005	0·0035	0·0035
Diameter of tympanum .....	0·003	0·003	0·0015	
Length of parotoid .....	0·012	0·013	0·0085	0·007
Breadth of parotoid.....	0·007	0·008	0·005	0·0055
Body .....	0·055	0·062	0·035	0·030
Fore limb .....	0·046	0·043	0·026	0·027
Hind limb .....	0·086	0·074	0·048	0·047
Tibia .....	0·023	0·020	0·014	0·014

*a.* ♂. Brussels. Brussels Museum.

*b.* ♀. Geneva. Brussels Museum.

*c.* Young ♀. Geneva. Brussels Museum.

*d.* Young ♂ without vertebral line or any trace of tarsal fold.  
Ciudad Real. M. Lataste's collection.

*Description.*—*Bufo calamita* is a short-limbed species, the physiognomy and habits of which are so peculiar that no one, I think, will any longer unite it with *B. viridis*, as was done forty years ago by the authors of the 'Erpétologie Générale.' However, the characters which are generally given for distinguishing the two species are not so constant as was thought until now, and, though sufficient in many cases, cannot always be relied upon. One of these characters is the presence in *B. calamita* and the absence in *B. viridis* of a yellow vertebral line; and we shall see further on that this line is sometimes absent in the former and often very distinct in the latter. Another character, which has been considered the most important, is the presence in *B. calamita* and the absence in *B. viridis* of a large parotoidiform gland on the upper side of the calf. Again, this becomes of no value if we consider a large series of these toads. I have seen many individuals of *B. viridis* from North Africa and especially from Asia, which possess the gland more or less developed, sometimes even more than is generally the case in *B. calamita*. It is on such a specimen from Algiers that M. Lataste established a new species, which he named after me, *B. boulengeri*, but which cannot be considered different from *B. viridis*, as M. Lataste himself acknowledges now that he has seen numbers of these toads during a journey in Algiers.

The shorter limbs of *B. calamita* will always, in adult specimens, be sufficient to distinguish it from *B. viridis*. Another character, which I have found to be quite constant in this species, is the disposition of the subarticular tubercles under the toes, most of which are in two rows; this character, which seems to have been discovered by Prof. Leydig, will immediately distinguish *B. calamita* not only

from *B. viridis* but also from *B. raddei*, the Chinese representative of *B. calamita*.

The length of the head equals three fourths or four fifths of its breadth; the snout is short and blunt, the loreal regions slightly concave, the canthus rostralis indistinct. The nostrils are a little nearer the anterior angles of the eyes than the tip of the snout; and the space between them equals that between one of them and the lip. The eyes are about equally distant from the tip of the snout and the angles of the jaws. The interorbital space is flat and narrow, its breadth being equal to two thirds or four fifths of the upper eyelid's greatest breadth. The tympanum is rather indistinct, generally quite hidden in its posterior half, small and rounded; its diameter does not equal half the greatest diameter of the orbit. The cleft of the mouth extends hardly beyond the posterior corners of the eyes. The tongue is elliptical, moderate; its length equals twice, or nearly twice, its breadth; it is somewhat broader in females than in males. The parotoids are small, ovate or subtriangular; they begin at a short distance from the upper eyelids, and are slightly convergent backwards; their breadth equals two thirds or four fifths of their length, which equals the distance between their anterior edge and the nostril or less.

The body is about three times as long as the head in females, a little less in males and young.

The fore limb is always shorter than the body, especially in females, which have it thinner than males. The fingers are short and rather pointed; the third is the longest; when laid side by side the first does not extend beyond the second, which is a little longer than the fourth; the thumb is hardly broader in males than in females; the subarticular tubercles are mostly two-rowed. There is a large flat rounded tubercle in the middle of the hand, and another, smaller and oval, at the base of the thumb.

The hind limb is relatively very short; a little longer than head and body in males, it is scarcely more, or even less, in females and young; if it is carried forwards against the body, the heel reaches to the posterior corner of the eye in males, to the shoulder in females and young. In these the tibia is scarcely longer than the head; it is rather longer in males; its upperside is occupied by a large parotoid-like gland, which, however, is sometimes rather indistinct. A cutaneous fold, generally very distinct, extends along more than half the length of the inner margin of the tarsus. The metatarsus is provided with two large tubercles, that at the base of the first toe oval and very prominent, that at the base of the fourth toe round and flat. The toes are depressed and short, especially in females, united at the base by a very short web; the fourth is one third longer than the third, which is distinctly shorter than the fifth; the subarticular tubercles are not very prominent, rounded, and mostly in two rows.

The warts which are spread on the back are not very prominent, are flattish, and never exhibit any trace of spines; the largest are distinctly porous to the naked eye; there are two or three very prominent ones at each angle of the mouth. These warts are little deve-

loped on the limbs. The lower surfaces are covered with rounded granules, which are much more developed and more distant from one another on the lower belly and under the thighs.

The coloration of the upper surface varies very much. The ground-colour is greenish, greyish, brownish, or pinkish, with numerous dark olive spots, very variable in size and in shape. These spots are generally more distinct from the ground-colour upon the limbs. The body is often dotted all over with black. The large warts on the back are often reddish, margined with black; those at the angles of the mouth are of a beautiful red; the parotoid and tibial glands are often reddish. Nearly always a narrow yellow vertebral line extends from the level of the anterior corners of the eyes to the vent; this line, however, may be more or less indistinct or even entirely absent. Females have often a light undulous stripe on the sides of the body. During the breeding-season males and females have the tips of the fingers and toes brown or black. The lower surfaces are dirty white, more or less abundantly spotted with blackish.

The iris is greenish yellow, vermiculated with black.

The males are furnished with a subgular vocal vesicle, which, when swollen, much resembles that of the common Tree-frog; the air penetrates by a short slit situated in the mouth, sometimes on the right side, sometimes on the left; in none of the specimens I have examined have I found two of these slits. During the breeding-season the male's throat is bluish or violet, and the first three fingers are furnished on their inner side with blackish rugosities.

*Skeleton*.—The prefrontals are large, subtriangular, convex, once and a half as broad as long, separated backwards by an angular prolongation of the superior plate of the ethmoid. The frontoparietals are flat, much broader backwards than forwards, especially in males, with a rather large central fontanelle. The anterior arm or zygomatic apophysis of the temporomastoidians is very short, rudimentary.

The length of the vertebral column to the base of the coccyx equals hardly once and a half that of the skull in males, once and two thirds in females. The diapophyses of the seventh and eighth vertebræ are directed slightly forwards; those of the ninth, or sacral, are strongly dilated, rather higher than broad. The coccyx is deprived of any trace of diapophysis at its base, and is of the same length as the skull.

The first metacarpian or rudiment of thumb, which is so much developed in the male *B. viridis*, is in this species scarcely distinct and rounded.

*Geographical Distribution*.—*B. calamita* is a Western Palearctic species, inhabiting Scotland, England, Belgium, France, Spain and Portugal, Southern Sweden, Denmark, Germany, Switzerland, Austria, and reaching eastwards to the frontiers of Russia. It seems to delight in the sea-coast, being very abundant on the dunes; in the interior it is rather local than rare.

2. *BUFO RADDEI*, Strauch.

*Bufo raddei*, Strauch, Voy. Lieut.-Col. Przewalski, Rept. et Batr. p. 53 (1876); Lataste, Rev. Intern. Sc. 1st year, p. 437 (1878).

*Characters*.—Crown of the head without bony ridges. Snout short, blunt. Interorbital space narrow. Tympanum small, round, very distinct. Parotoids large, kidney-shaped or suboval, depressed. Fingers short, with single-rowed subarticular tubercles; first not extending beyond second. Hind limbs short; a parotoid-like gland on the calf; a cutaneous fold along the inner edge of the tarsus; toes short, webbed at the base, with single-rowed subarticular tubercles. Upper parts with irregular, depressed, distinctly porous warts. Brown- or blackish-spotted or marbled above; a light vertebral stripe; beneath whitish, generally unspotted. Male with a little-developed subgular vocal sac.

*Dimensions.*

	<i>a.</i>	<i>b.</i>	<i>c.</i>
	m.	m.	m.
From snout to vent .....	0·062	0·072	0·031
Length of head .....	0·019	0·021	0·010
Breadth of head .....	0·022	0·025	0·011
From eye to nostril .....	0·005	0·0055	0·003
From eye to tip of snout .....	0·0095	0·010	0·005
Greatest diameter of orbit .....	0·007	0·0075	0·0045
Interorbital space .....	0·004	0·004	0·0025
Diameter of tympanum .....	0·003	0·0035	
Length of parotoid .....	0·0125	0·015	0·0075
Breadth of parotoid .....	0·0085	0·010	0·0045
Body .....	0·043	0·051	0·021
Fore limb .....	0·035	0·038	0·016
Hind limb .....	0·073	0·078	0·030
Tibia .....	0·020	0·022	0·0095

*a.* ♂. Chefoo. M. Lataste's collection.

*b.* ♀. Chefoo. M. Lataste's collection.

*c.* Young. Amour. M. Lataste's collection.

*Description*.—This species is very closely allied to the preceding one, having like it short limbs, scarcely webbed toes, a very much developed parotoid-like gland on the upperside of the calf, and the first finger not extending beyond the second; it approaches *B. viridis* in the simple subarticular tubercles under the toes, the very distinct tympanum, and large parotids. It must be regarded as an intermediate form between *B. calamita* and *B. viridis*.

The head resembles in shape that of *B. calamita*, but is relatively larger and its breadth a little less with regard to its length. The nostrils are equally distant from the anterior corners of the eyes and the tip of the snout; and the space between them equals that which separates one of them from the lip. The eyes are a little nearer to the tip of the snout than to the angles of the jaws. The interorbital



space is flat and narrow, its breadth equalling about two thirds of the greatest breadth of the upper eyelid. The tympanum is always very distinct in adult specimens; its greatest diameter equals about half that of the eye. The cleft of the mouth extends to the level of the front edge of the tympanum, or a little beyond. The tongue does not differ from that of *B. calamita*. The parotoids are large, broad, depressed, oval, subtriangular or kidney-shaped, beginning at a short distance behind the upper eyelids, their inner edges slightly convergent backwards; they are larger in females than in males; if directed forwards, their extremity would reach the nostrils in the former, scarcely beyond the eyes in the latter.

The body is about twice and a half as long as the head in females, somewhat less in males and young.

The fore limb is always shorter than the body; it is stronger in males. The fingers do not differ in shape and proportions from those of *B. calamita*; but the subarticular tubercles are single-rowed.

The hind limb is not quite so short as that of *B. calamita*, nor so long as that of *B. viridis*; if it be carried forwards along the body the metatarsal tubercles reach the middle of the eye in males, the tympanum in females and young. The tibia is a little longer than the head, and provided on its upperside with a large gland like that of *B. calamita*. The cutaneous tarsal fold is not so distinct as is generally the case in *B. calamita*. The inner metatarsal tubercle is strong, oval, and very prominent; the outer one is rounded and much smaller than that of *B. calamita*. The toes are a little longer than those of that species, webbed at the base, and provided with simple subarticular tubercles.

The warts upon the body do not differ from those of *B. calamita*.

The upper surfaces are of a light olive tint, with large, insuliform, chestnut-brown or blackish, more or less confluent spots, giving the animal a very beautiful appearance; these spots respect the vertebral line, where the light ground-colour appears as a rather broad dorsal stripe. This is especially the case in females, whilst in males the spots are generally much less accentuated, and the vertebral stripe consequently rather inconspicuous. The tips of the fingers, and sometimes of the toes, are blackish brown. The lower surfaces are dirty white; very seldom a few small blackish spots may be seen wide apart on the belly.

Such is the coloration of specimens preserved in spirit. It differs very little from that of the living animal, as I know from two water-colours which M. Collin de Plancy had executed by a Chinese artist in Pekin, one of which has been kindly given to me by M. Lataste. These paintings represent the fingers and toes flesh-coloured, and the iris greenish yellow abundantly vermiculated with black, except a narrow ring round the pupil.

The males (which do not seem to reach the size of the females) are provided with a subgular vocal sac, which is much less developed than that of *B. calamita*; the apertures inside the mouth are, as in that species, either on the right side or on the left, or they may be double.

The blackish rugosities on the inner side of the first three fingers are like those of *calamita*.

*Skeleton* (from a single female specimen).—Differs slightly from that of *B. calamita*. The skull is larger, its length being included once and a third in that of the trunk. The fronto-parietal bones are scarcely broader backwards than forwards. The zygomatic apophysis of the temporomastoidians is more developed, measuring about half the length of the mastoidian apophysis.

*Geographical Distribution*.—This species represents in Eastern Asia our *B. calamita*. Like it, it is very abundant on the sea-coast, the numerous specimens sent from China to M. Lataste, by his friend M. Collin de Plancy, having been collected on the sea-shore at Chefoo. The typical specimens of Dr. Strauch come from the valley of the Amour and from Daouria.

### 3. *BUFO VIRIDIS*, Laurenti.

*Bufo viridis*, Laurenti, Syn. Rept. pp. 27 & 111, pl. i. (1768); Daudin, Hist. Rain. Gren. Crap. p. 79, pl. 28. f. 2 (1802); Daudin, Hist. Rept. viii. p. 156 (1803); Bonaparte, Faun. Ital. (1832); Guichenot, Voy. Abyss. Lefebvre &c. part iv. Zool. p. 221 (1848); Günther, Cat. Batr. Sal. p. 58 (1858); Strauch, Mém. Ac. St. Pétersb. sér. 7, iv. 7, p. 79 (1862); Steindachner, Reise Novara, Zool. i. p. 39 (1869); Fatio, Faune Vert. Suisse, iii. p. 411 (1872); De Betta, Faun. Ital. Rett. Anf. p. 74 (1875); Lessona, Atti Ac. Lincei, Mem. Cl. Sc. Fis. &c., i. p. 1085, pl. iv. (1877).

*Bufo schreberianus*, Laurenti, l. c. p. 27.

*Rana variabilis*, Pallas, Spicil. Zool. vii. p. 1, pl. vi. f. 1 & 2 (1769).

*Bufo variabilis*, Merrem, Syst. Amph. p. 180 (1820); Eichwald, Zool. Spec. Ross. Pol. p. 167 (1831); Schreiber, Herp. Eur. p. 138 (1875); Leydig, An. Batr. p. 29 (1877).

*Bufo arabicus*, Rüppell, Reise nördl. Afr. Rept. p. 20, pl. v. f. 2 (1827).

*Bufo viridis*, part., Duméril & Bibron, Erp. Gén. viii. p. 681 (1841).

*Bufo calamita*, Günther, Rept. Brit. Ind. p. 426 (1864).

*Bufo boulengeri*, Lataste, Rev. Intern. Sc. 2nd year, p. 438 (1879).

*Bufo hemprichii*, Fitzinger, MS.

*Characters*.—Crown of the head without bony ridges. Snout short, rather blunt. Interorbital space narrow. Tympanum small, round, distinct. Parotoids very variable in shape and in size, generally moderately elongate and kidney-shaped, depressed, sometimes enormous. Fingers moderate, with generally two-rowed subarticular tubercles; first extending a little beyond second. Hind limbs moderate; parotoidiform gland on the calf absent, or more or less developed; a cutaneous fold along the inner edge of the tarsus; toes moderate, half-webbed, with simple subarticular tubercles. Upper parts with irregular, depressed, distinctly porous warts. Olive- or

greenish-spotted or marbled above; generally without light vertebral line; beneath whitish, uniform or black- or olive-spotted. Male with a very broad thumb and a little-developed subgular vocal sac.

*Dimensions.*

	<i>a.</i>	<i>b.</i>	<i>c.</i>	<i>d.</i>	<i>e.</i>	<i>f.</i>	<i>g.</i>
	m.	m.	m.	m.	m.	m.	m.
From snout to vent .....	0.072	0.067	0.039	0.059	0.070	0.082	0.078
Length of head .....	0.018	0.017	0.011	0.017	0.020	0.022	0.021
Breadth of head .....	0.025	0.025	0.0135	0.022	0.024	0.028	0.026
From eye to nostril .....	0.0045	0.005	0.003	0.005	0.005	0.0055	0.005
From eye to tip of snout .....	0.0095	0.0095	0.0055	0.009	0.009	0.011	0.010
Greatest diameter of orbit .....	0.007	0.007	0.005	0.007	0.007	0.007	0.007
Interorbital space .....	0.005	0.005	0.0035	0.005	0.0045	0.0055	0.005
Diameter of tympanum .....	0.0035	0.003	0.0015	0.0035	0.003	0.003	0.003
Length of parotoid .....	0.016	0.013	0.0075	0.012	0.014	0.023	0.022
Breadth of parotoid .....	0.008	0.0065	0.004	0.006	0.007	0.013	0.010
Body .....	0.054	0.050	0.028	0.042	0.050	0.060	0.057
Fore limb .....	0.047	0.042	0.024	0.040	0.041	0.045	0.050
Hind limb .....	0.086	0.077	0.048	0.077	0.080	0.093	0.102
Tibia .....	0.024	0.022	0.013	0.022	0.023	0.028	0.029

- a.* ♂. Copenhagen. Brussels Museum.  
*b.* ♀. Hungary. Brussels Museum.  
*c.* Young. Hungary. Brussels Museum.  
*d.* ♀. Egypt. M. Lataste's collection.  
*e.* ♀. Algiers. Type of *Bufo boulengeri*. M. Lataste's collection.  
*f.* ♀. Noukouss, Amou-Daria (Asia). M. Lataste's collection.  
*g.* ♂. Tschinas, Turkestan. St.-Petersburg Museum.

These two last specimens have enormous parotoids and a very large parotoid-like gland on the calf.

*Description.*—Compared with that of *B. calamita*, the head is rather more depressed, the snout more prominent, the canthus rostralis more distinct. The nostrils are equally distant from the anterior corners of the eyes and from the tip of the snout; the space between them is rather less than that between one of them and the lip. The eyes are equally distant from the tip of the snout and from the angles of the jaws. The interorbital space is flat and narrow, its breadth equalling two thirds of the upper eyelid's greatest breadth. The tympanum is always quite distinct, at least in its anterior half, rounded or a little higher than broad; its transversal diameter equals about half that of the eye. The cleft of the mouth extends to the level of the posterior corners of the eyes. The tongue varies much; it is generally moderately large, elliptical, about twice as long as broad: in some Asiatic specimens it is very large, pear-shaped, its greatest breadth contained once and a third in its length, covering nearly the whole surface of the mouth; other specimens

are intermediate. The parotoids exhibit astonishing variations; in all the European and African specimens I have seen, as in most of the Asiatic ones, the parotoids are more or less kidney-shaped, their greatest width being forwards, and more elongate than those of *B. calamita*, their length equalling double their breadth, and the distance between their front edge and the tip of the snout, or nearly so; in some Asiatic specimens<sup>1</sup> they are enormous, often ovate, much longer than the head, and once and a half to twice as long as broad. These differences in the dimensions of these glands do not correspond either with the age, sex, or origin of the specimens; and as (among the numerous Asiatic specimens kindly sent to me by Dr. Strauch) I have found intermediate forms, I am convinced that these modifications are nothing more than individual, and do not necessitate the establishment of a distinct variety, as I should certainly have done had I not had a large series of specimens from various localities. Whatever be their form, the parotoids are depressed, and anteriorly in contact with the upper eyelids.

The body is about three times as long as the head; and there is but little variation between sexes in that respect.

The proportions of the fore limb are the same as in *B. calamita*; but the fingers are not so short nor so pointed; the third is the longest, then come the first, the second, and the fourth; the first, or thumb, which is very broad in males, being laid against the index, exceeds it a little in length; the subarticular tubercles are two-rowed, often imperfectly, under the first and sometimes the second and third fingers. The tubercles of the hand are like those of *B. calamita*.

The hind limb is longer than that of *B. calamita* and *B. raddei*; being carried forwards along the body, the metatarsal tubercles reach the anterior corner of the eye in males, the posterior corner in females; the tibia is always considerably longer than the head, and sometimes with a parotoid-like gland, sometimes without. It was first noticed by M. Lataste on an Algerian specimen, which he therefore, and also on account of its origin, regarded as the type of a new species; but other Algerian specimens do not exhibit the least trace of that gland. I have found it, and much developed, on some Asiatic specimens; and I thought for some time, before I had an opportunity to examine a great number of these Toads, that its presence corresponded with the extraordinary size of the parotoids, and that these two characters united indicated a species distinct from *B. viridis*; but now I have seen the gland in specimens with normal parotoids. I have, however, never noticed it somewhat developed in any European specimen. It is therefore necessary to give up considering the absence of a parotoid-like gland on the upperside of the calf a character of absolute value, distinguishing this species from the two preceding ones. The cutaneous fold along the tarsus is like that of *B. calamita*. The metatarsus is provided with two tubercles, the inner one a little more prominent than in *B. calamita*. The toes are moderately elongate, the fourth one third longer than the third;

<sup>1</sup> Noukouss (Amou-Daria), Tschinas (Turkestan), Mangyschlak (eastern coast of the Caspian Sea).

they are depressed and half-webbed; the subarticular tubercles are large and single-rowed.

The back is covered with more or less prominent, sometimes spinous, distinctly porous warts of various sizes; as in the preceding species, those at the angles of the mouth are much developed. Very often a series of larger prominent warts extends on each side of the body; this character is very conspicuous in specimens from Denmark. The upper surface of the forearms and calves is nearly smooth; that of the arms and thighs is slightly warty. The granules of the lower surfaces are larger and more distant from one another on the lower belly and under the thighs.

The upper surfaces are covered with large, irregular, insuliform, more or less confluent, olive or green spots, often margined with black, on a greyish, brownish, or pinkish ground. These spots are sometimes smaller, isolated, resembling the markings of some species of *Felis*. They are rarely interrupted on the vertebral line, as is the case in *B. raddei*. The larger warts of the angles of the mouth, of the sides of the body, and sometimes of the back, of a reddish or pinkish tint. The large greenish spots are generally more accentuated in females than in males. Contrary to what Dr. Fatio<sup>1</sup> thought, the specimens always have a duller coloration during the breeding-season. A character which has often been used as distinguishing this species from *B. calamita* is the absence in the former and the presence in the latter of a yellow vertebral line. But this line, which is sometimes wanting in *B. calamita*, sometimes occurs in *B. viridis*; I have seen many specimens, from Italy and from Algiers, which exhibit more or less distinct traces of it. The lower surfaces are dirty-white, sometimes without, sometimes with more or less abundant blackish or olive spots. The presence or absence of these spots does not correspond with the sexes.

The iris is greenish yellow, vermiculated with black.

The males are furnished with a subgular vocal sac, which is much less developed and less pigmented than that of *B. calamita*; as in the latter, the openings which give access to the air are sometimes on the left, sometimes on the right side. Blackish rugosities occupy the inner side of the first three fingers during the breeding-season; on the thumb they cover a much greater surface than in any other species of *Bufo*.

*Skeleton*.—The prefrontals are large, subtriangular, convex, once and a half as broad as long, in contact on their whole inner surface, or slightly separated behind by the prolongation of the upper plate of the ethmoid. The fronto-parietals are flat, much broader backwards than forwards, especially in males; the fontanelle is much smaller than in *B. calamita*. The zygomatic apophysis of the temporomastoidians is very short.

The vertebral column, to the base of coccyx, measures once and a third in males, once and a half in females, the length of the skull. The diapophysis of the seventh and eighth vertebrae are rather strongly directed forwards; those of the ninth or sacral are a little

<sup>1</sup> Faune des Vertébrés de la Suisse, iii. p. 413.

less dilated than in *B. calamita*. The coccyx is a little longer than the skull, without any trace of diapophysis at its base.

The males have the first metacarpian or rudiment of thumb very much developed.

*Geographical Distribution.*—The geographical range of *B. viridis* is a very extensive one. It is the only *Bufo* inhabiting both Palæarctic and Æthiopian Regions. In Europe it is found in the eastern half, from Southern Sweden and Denmark to the extreme south; it is totally absent from Great Britain, Belgium, Holland, France, and the Spanish peninsula; in Switzerland it inhabits the region south of the Alps. It extends over entire Temperate Asia, being found eastwards in China and in the Thibet, whence the British Museum has received specimens, which Dr. Günther has considered, in his great work on the Reptiles of British India, as belonging to *B. calamita*. Dr. Strauch has communicated to me the list of the Asiatic localities whence the St.-Petersburg Museum has received specimens; I think it will be of some interest to reproduce it here:—“Aralykh (Mount Ararat), Bakou, Barnaoul, Bessarabia, Caucasus, Elisabethpol, river Emba, river Ili, Kherson, Kholdsha (western frontiers of China), Kirschnew, Maugyschlak (eastern coast of the Caspian Sea), Nicolajew, Noukouss (Amou Daria), Nowo-Alexandrowik, Odessa, Soudagh (Crimea), Tiflis, source of Tongensken, Tschabroutsch (Bessarabia), Tschaptschatschi, Tschinas (Turkestan), Tse Balkhasch, Uenowka (Transcaucasia).” I have also seen specimens from Lebanon and Arabia. It extends over the northern coast of Africa, from Egypt, where it is rather common, to Algiers.

#### 4. *BUFO MAURITANICUS*, Schlegel.

*Bufo arabicus*, Gervais, Ann. Sc. Nat. sér. 2, vi. p. 312 (1836).

*Bufo mauritanicus*, Schlegel, Wagn. Reis. Alg. iii. p. 134 (1841).

*Bufo pantherinus*, part., Duméril & Bibron, Erp. Gén. viii. p. 687 (1841); Günther, Cat. Batr. Sal. p. 59 (1858).

*Bufo pantherinus*, Guichenot, Expl. Sc. Alg. Zool. v. p. 23 (1850); Strauch, Mém. Ac. Sc. St. Pétersb. sér. 7, iv. 7, p. 80 (1862).

*Characters.*—Crown of the head without long ridges. Snout short, blunt. Interorbital space broad, concave. Tympanum small, suboval, distinct. Parotoids rather large, elliptic, depressed. Fingers moderate, with two-rowed subarticular tubercles; first much longer than second. Hind limbs moderate; no large gland on the calf; a cutaneous fold along the inner edge of the tarsus; toes moderate, webbed at the base, with two-rowed subarticular tubercles. Upper parts with irregular, depressed, distinctly porous warts; above with large insuliform brown, olive, or reddish spots; beneath whitish, unspotted. Male with a rather developed subgular vocal sac,

*Dimensions.*

	a.	b.	c.
	m.	m.	m.
From snout to vent .....	0.112	0.122	0.041
Length of head .....	0.030	0.033	0.012
Breadth of head .....	0.040	0.045	0.016
From eye to nostril .....	0.008	0.008	0.003
From eye to tip of snout.....	0.013	0.014	0.0055
Greatest diameter of orbit .....	0.012	0.0125	0.005
Interorbital space.....	0.010	0.012	0.004
Horizontal diameter of tympanum.....	0.004	0.0055	0.002
Vertical diameter of tympanum.....	0.0055	0.0065	0.0025
Length of parotoid .....	0.024	0.026	0.008
Breadth of parotoid.....	0.013	0.015	0.0045
Body .....	0.082	0.089	0.029
Fore limb .....	0.082	0.079	0.023
Hind limb.....	0.155	0.163	0.048
Tibia .....	0.046	0.050	0.016

a. ♂. Loc.? Brussels Museum.

b. ♀. Loc.? Brussels Museum.

c. Young. Loc.? Brussels Museum.

*Description.*—This species has generally been confounded with the following one, from which it differs chiefly in its physiognomy, its small tympanum, its very concave fronto-parietal bones, and its two-rowed subarticular tubercles under the fingers and toes.

The head resembles that of *B. viridis*; but the interorbital space is very concave in adult specimens, and broad, its breadth being always more than the greatest breadth of the upper eyelid. The nostrils are rather nearer the tip of the snout than to the anterior corners of the eyes; the space between them equals that between one of them and the lip. The eyes are equally distant from the tip of the snout and from the angles of the jaws. The tympanum is very distinct, subovate; its greatest diameter, the vertical, is somewhat more than half the horizontal diameter of the orbit. The cleft of the mouth extends to the level of the centre of the tympanum. The tongue is generally broader than in the preceding species, its breadth equalling about two thirds of its length in males, three fourths in females. The parotoids are rather large, depressed, elliptic, their inner edges slightly divergent backwards, their front edges nearly in contact with the upper eyelids; their length equals nearly the double of their breadth, or the distance between their anterior edge and the tip of the snout.

The body is rather more than twice and a half as long as the head, with slight difference between the sexes; it is shorter in young.

The fore limb is very stout and as long as the body in males, thinner and much shorter in females. The fingers are moderately elongate, truncated or even slightly swollen at the tips, especially in

old specimens; the first and third fingers are about equally long; the first being laid against the second, exceeds it by about one third or one fourth of its own length; the subarticular tubercles are double, although often imperfectly. The principal palmar tubercle is relatively larger than that of *B. viridis*.

The hind limb is longer than in the preceding species; being carried forwards along the body, the metatarsal tubercles reach the tip of the snout in males, the anterior corner of the eye, or slightly beyond, in females; the calf is much longer than the head, and without parotoid-like gland. The cutaneous tarsal fold is like that of *B. viridis*. The metatarsal tubercle at the base of the first toe is strong, oval, very prominent; that at the base of the fourth toe rather smaller, subcircular, flat. The toes are somewhat longer than those of *B. viridis*, slightly depressed, very obtuse; the fourth is one third longer than the third, which is a little longer than the fifth; they are united at the base by a short web, which extends as a fold along their borders; most of the subarticular tubercles are two-rowed.

The warts of the back and sides are like those of the preceding species, and sometimes spinose. The upper surface of the forearms and calves, instead of being nearly smooth, are strongly warty. The granules of the inferior surfaces are larger and more distant from one another upon the lower belly and under the thighs.

The upper parts are greenish yellow or brownish, with large, insuliform, rarely confluent, olive, or reddish-brown black-margined spots. M. Héron Royer has shown me a living specimen which is above light grey, with some traces of spots on the head only. The lower surfaces are dirty white or yellowish, without spots. The tips of the fingers and toes are, at least during the breeding-season, reddish-brown or blackish.

The iris is light yellow; on each side of the pupil, the black vermiculations, which are nearly absent above and beneath, cover the yellow tint, and produce the aspect of a dark vitta through the eye.

The males are provided with a subgular vocal vesicle, which is nearly as much developed as in *B. calamita*; the few males I have had the opportunity to examine have either two vocal slits or only one on the right side. During the breeding-season the throat is bluish, and the first three fingers are provided with black rugosities like those of *B. calamita*.

*Skeleton*.—The skull of *B. mauritanicus* is very remarkable, and differs greatly from that of the preceding species, approaching in some respects that of some Indian and American species, *B. melanostictus* and *B. aqua* for instance. The fronto-parietal bones, which do not show any trace of a fontanelle, and which are even sometimes nearly soldered together, expand laterally into a sort of crest, which, united with another one formed by the supraorbitals, to which they are quite soldered, borders the orbit above and behind; these bones are very concave, and nearly twice as broad backwards as forwards. The prefrontals are large, a little broader than long. Sometimes the prefrontals and fronto-parietals meet together along their



entire edges; sometimes they leave between them a little lozenge-shaped space, in which the upper plate of the ethmoid remains uncovered. The zygomatic apophysis of the temporomastoidians is very short.

The length of the vertebral column to the base of coccyx equals hardly once and a half that of the skull in both sexes. The diapophyses of the eighth vertebra are strongly directed forwards; those of the sacral are very dilated, as high as broad. The coccyx, which sometimes presents traces of diapophysis at its base, is longer than the skull, measuring the length of the first eight vertebrae.

In the males the rudiment of a thumb is rather developed.

*Geographical Distribution.*—*Bufo mauritanicus* inhabits only the Palearctic part of Africa. It has been found in Tunis, in Algiers (where it is very abundant), and in Morocco.

#### 5. BUFO REGULARIS, REUSS.

*Grenouille ponctuée*, Geoffroy, Descr. Egypte, Rept. pl. 4. f. 1 & 2 (1809).

*Bufo regularis*, Reuss, Mus. Senckenb. i. p. 60 (1834).

*Bufo pantherinus*, part., Duméril and Bibron, Erp. Gén. viii. p. 687 (1841); Günther, Cat. Batr. Sal. p. 59 (1858).

*Bufo cinereus*, Hallowell, Proc. Ac. N. S. Philad. ii. p. 169 (1850).

*Bufo maculatus*, Hallowell, l. c. vii. p. 101 (1854).

*Rana mosaica*, Seetzen, Reise Syr. Paläst. iii. p. 492 (1855).

*Bufo guineensis*, Günther, Cat. p. 59 (1858).

*Bufo spinosus*, Barboza du Bocage, Proc. Zool. Soc. Lond. 1868, p. 845.

*Bufo pantherinus*, Boié, MS.

*Bufo nubicus*, Fitzinger, MS.

*Characters.*—Crown of the head without bony ridges. Snout short, rather blunt. Interorbital space rather broad. Tympanum large, ovate, very distinct. Parotoids elliptic, more or less elongate, more or less prominent. Fingers moderate, with simple subarticular tubercles, first much longer than second. Hind limbs moderate, no large gland on the calf; a cutaneous fold along the inner edge of the tarsus; toes moderate, one third webbed, with simple subarticular tubercles. Upper parts with irregular, depressed, indistinctly porous warts. Above uniform or variously spotted; sometimes a yellowish vertebral line. Beneath immaculate or with large burnt-like spots. Male, with a little-developed subgular vocal sac.

*Dimensions.*

	<i>a.</i>	<i>b.</i>	<i>c.</i>	<i>d.</i>	<i>e.</i>	<i>f.</i>	<i>g.</i>
	m.	m.	m.	m.	m.	m.	m.
From snout to vent .....	0.069	0.093	0.085	0.038	0.051	0.053	0.136
Length of head .....	0.021	0.025	0.021	0.011	0.015	0.014	0.037
Breadth of head .....	0.025	0.032	0.028	0.013	0.017	0.019	0.047
From eye to nostril .....	0.0055	0.0055	0.005	0.003	0.003	0.003	0.008
From eye to tip of snout .....	0.010	0.011	0.010	0.005	0.006	0.006	0.017
Greatest diameter of orbit .....	0.008	0.009	0.008	0.005	0.006	0.006	0.012
Interorbital space .....	0.0055	0.007	0.006	0.004	0.003	0.004	0.014
Horizontal diameter of tympanum ..	0.0045	0.0055	0.005	0.002	0.004	0.0035	0.006
Vertical diameter of tympanum .....	0.006	0.0065	0.007	0.0025	0.005	0.004	0.007
Length of parotoid .....	0.014	0.022	0.022	0.008	0.010	0.011	0.024
Breadth of parotoid .....	0.005	0.010	0.008	0.003	0.005	0.004	0.013
Body .....	0.048	0.068	0.064	0.027	0.036	0.039	0.099
Fore limb .....	0.041	0.050	0.045	0.020	0.033	0.032	0.078
Hind limb .....	0.086	0.112	0.090	0.043	0.063	0.064	0.162
Tibia .....	0.026	0.033	0.028	0.013	0.019	0.019	0.047

*a.* ♂. Gaboon. Brussels Museum.

*b.* ♀. Senegal. Paris Museum.

*c.* ♀. Benguella. Milan Museum.

*d.* Young. Egypt. Brussels Museum.

*e.* ♂. Var. A. Boutry, W. Africa. Leyden Museum (as *B. pantherinus*).

*f.* ♀. Var. A. Boutry, W. Africa. Leyden Museum (as *B. pantherinus*).

*g.* ♀. Var. B. Port Elizabeth. British Museum.

*Description.*—The head resembles that of *B. vulgaris*. The snout is short, rather prominent, truncated; the canthus rostralis is rather distinct. The nostrils are nearly equally distant from the anterior angles of the eyes and from the tip of the snout; and the distance between them equals two thirds of that between one of them and the lip. The eyes are nearly equally distant from the tip of the snout and from the angles of the jaws. The interorbital space, flat or slightly concave, is rather broad, its breadth being equal to or a little less than the greatest breadth of the upper eyelid. The tympanum is very distinct, large, vertically oval; its greatest diameter equals at least three fourths of that of the eye in the adult; it is smaller in the young. The cleft of the mouth extends to the level of the centre of the tympanum. The tongue is rather large, elliptic, nearly twice as long as broad. The parotoids vary greatly; though always elliptical, and with slightly divergent inner edges, they may be very prominent or depressed, longer or shorter than the head from their front edge to the tip of the snout; their breadth equals from a third to half their length. But all these differences correspond with no others, nor with the localities whence the specimens come; and in a large series of specimens it is easy to find all the transitions; so that no importance must be attached to these peculiarities.

The body is twice and a half or three times as long as the head. There is no important difference between the sexes in this respect.

The fore limb is always shorter than the body. The fingers are either rather obtuse or very pointed. To whoever has not examined a great number of specimens it would appear as if two varieties might be established on account of the different shape of the fingers; but that would certainly not be natural, as there are intermediate specimens which could not be placed in either of the two varieties: nevertheless this is a very remarkable fact, which I have not met with in any other species of *Bufo*. The first finger is generally shorter than the third, and always longer than the second, which is as long as the fourth; the subarticular tubercles are simple. The principal palmar tubercles are a little smaller than in the preceding species.

The hind limb being carried forwards against the body, the metatarsal tubercles reach the tympanum or the anterior corner of the eye; the calf is much longer than the head, and without any trace of parotoid-like gland. The tarsal fold is narrow and very distinct, extending at least two thirds the length of the tarsus. The metatarsal tubercles do not differ from those of *B. viridis*. The toes are moderately elongate, slightly depressed, the fourth one third longer than the third, and show the same variations as the fingers, being either obtuse or pointed; they are one third webbed; the subarticular tubercles are pointed and very prominent.

The back and sides are covered with irregular depressed, sometimes spinous warts, the pores of which are generally not distinct to the naked eye; the upperside of the limbs is more or less warty. Young specimens exhibit along the outer edge of the forearm a row of very prominent rounded tubercles, which can also be seen, but much less prominent, in adult individuals. The lower surfaces are covered with small granules, which, contrary to what is seen in the preceding species, are not larger on the lower belly and under the thighs; behind the thighs are larger pearl-like ones; there are large rounded tubercles under the tarsi.

The upper surfaces are brown, greyish, or reddish, with or without a yellowish vertebral line; the young always show on each side of the back three or four dark brown or reddish black-margined spots, and two others, chevron-shaped, between the eyelids; there are also vertical ones on the sides of the head, and transversal ones upon the limbs. In the adult these spots often become indistinct, irregular, or entirely absent. Sometimes then the upper surfaces are entirely dark greyish-brown, with scarcely any traces of the dark regular spots, and with some large, irregular, distant white spots. The lower surfaces are greyish, immaculate, or sometimes with reddish-brown burnt-like spots. The throat is blackish in males.

Males do not differ considerably from females; they possess a little-developed subgular vocal sac, the internal openings of which are double in all the specimens I have examined. Blackish rugosities cover the inner surface of the first two fingers during the breeding-season.

*Varietas A.*—This form is, perhaps, specifically different from the former, as it does not reach a size much superior to that of a full-grown *Alytes obstetricans*. The tympanum is quite close to the eye; and the fingers are very slender. However, I will not venture to separate it from *B. regularis*, as the last two characters are not of great importance, being subject to a certain variation.

This is the form which was considered distinct from "*B. pantherinus*" by Dr. Günther, who named it *B. guineensis*, after the Leyden-Museum specimens. But the types of *B. guineensis* examined by M. Lataste agree with the typical *B. regularis*; therefore, should this form be considered a distinct species, the name *guineensis* must not be applied to it. *B. spinosus*, Barboza du Bocage, is, I think, to be referred to this variety.

*Varietas B.*—Differs from *B. regularis* typus in its larger size, its rather concave interorbital space, and in its coloration, which in some specimens, however, approaches very closely that of the typical form. The upper surfaces are olive or brownish, with four or five pairs of very large, irregular, dark brown spots; there is generally a yellowish vertebral line. The young have generally the dorsal spots of a fine pink colour, black-margined, beneath immaculate.

*Geographical Distribution.*—*B. regularis* inhabits the whole of continental Æthiopian Africa. Var. A is confined to the western coast, where it occurs with the typical form; var. B alone represents the species in the south.

Seetzen has observed this species in Egypt, where it is very plentiful. He says:—"On September 19th (1808) I had one of the frogs captured which croaked in the flooded fields between Kahira and Bulak after sunset; and I was convinced that these croaking-frogs, the voice of which is heard in the evening from the beginning of September, are nothing else than these toads, which, immediately after the flood, spread over the flooded plain, where the sexes meet for breeding; but at other times of the year they are never heard in the fountains, where they can be found at any time. At the end of this month and in the beginning of October the voice of these toads ceases gradually; and at the end of October they can be heard no more."

*Historic.*—This species is first mentioned in the 'Description de l'Égypte,' 1809, where Geoffroy St.-Hilaire gives a good figure of it under the name "Grenouille ponctuée," but does not describe it.

In 1834 Reuss describes it from specimens brought from Egypt by Rüppell, and names it *Bufo regularis*. He identifies his *B. regularis* with "Grenouille ponctuée" of Geoffroy, and *B. nubicus*, Fitzinger, MS.

The 'Erpétologie générale' unites, under the name of *B. pantherinus*, Boié MS., two quite distinct species, viz. *B. mauritanicus*, Schlegel, and *B. regularis*, Reuss.

Afterwards Hallowell describes, very concisely, the species, giving it the name of *B. cinereus*, which he changed afterwards to that of

*B. maculatus*, the term *cinereus* having been applied to our common toad by Schneider and Daudin.

This species is described in Seetzen's 'Voyage in Syria, Palestine, and Egypt,' and named *Rana mosaica*. It is easy to recognize it by the not very technical description of Seetzen. We see that the tympanum is oval, the first finger longer than the second, the throat blackish, the latter character being evidently only applicable to males. If we consider that Egypt is inhabited by only two species of *Bufo* (*B. regularis* and *B. viridis*), and that the latter never exhibits a blackish throat, that its tympanum is round, and not oval, and that the disproportion between the thumb and the index is too slight to have been noticed by a naturalist such as Seetzen, we cannot doubt that the identification of *R. mosaica* and *B. regularis* is correct. Desirous, however, to have further information on this subject, I wrote to Prof. Peters, in Berlin, who has answered me that Seetzen's collection has not been preserved.

Dr. Günther, in his 'Catalogue of Batrachia Salientia,' 1858, admits two African species besides *B. tuberosus*, viz. *B. pantherinus* and *B. guineensis*. The former corresponds to *B. mauritanicus* and *B. regularis* typus and var. B, the latter to *B. regularis* var. A. M. Lataste has, through the kindness of Prof. Schlegel and Dr. Steindachner, examined the types of *B. pantherinus*, Boié MS., *B. guineensis*, Schlegel MS., and *B. nubicus*, Fitzinger, MS., and has found them identical with *B. regularis* typus.

I have not employed for this species the name of *pantherinus*, because this MS. name, though first intended for it by Boié, has been applied to two or more very distinct species, and would therefore be a source of confusion.

#### 6. BUFO ANGUSTICEPS, Smith.

*Bufo pantherinus*, part., Duméril and Bibron, Erp. Gén. viii. p. 687 (1841).

*Bufo angusticeps*, Smith, Ill. Zool. S. Afr. pl. 69. f. 1 (1849); Günther, Cat. Batr. Sal. p. 59 (1858).

*Bufo gariepensis*, Smith, l. c. pl. 69. f. 2.

*Characters*.—Crown of the head without bony ridges. Snout short, blunt. Interorbital space rather narrow. Tympanum very small, round, distinct. Parotoids generally small, elliptic or sub-oval, depressed. Fingers short, with single or two-rowed sub-articular tubercles; first not extending beyond second. Hind limbs short; no parotoid-like gland on the calf; cutaneous fold on the inner edge of the tarsus more or less distinct, or entirely absent; toes short, webbed at the base, with single or two-rowed sub-articular tubercles. Upper parts with irregular, depressed, distinctly porous warts. Brown or olive, spotted or marbled above; generally a yellowish vertebral line; beneath whitish, generally immaculate. Male with a little-developed subgular vocal sac.

*Dimensions.*

	<i>a.</i>	<i>b.</i>	<i>c.</i>	<i>d.</i>
	m.	m.	m.	m.
From snout to vent.....	0·048	0·051	0·061	0·035
Length of head.....	0·013	0·015	0·016	0·010
Breadth of head .....	0·016	0·018	0·020	0·012
From eye to nostril.....	0·0035	0·0035	0·0035	0·0025
From eye to tip of snout....	0·0065	0·0075	0·007	0·005
Greatest diameter of orbit ...	0·006	0·007	0·0065	0·005
Interorbital space.....	0·0035	0·004	0·004	0·0025
Diameter of tympanum .....	0·002	0·002	0·002	0·001
Length of parotoid .....	0·008	0·009	0·010	0·006
Breadth of parotoid.....	0·004	0·0045	0·0045	0·004
Body .....	0·035	0·036	0·0045	0·025
Fore limb .....	0·028	0·034	0·032	0·019
Hind limb.....	0·055	0·061	0·065	0·037
Tibia .....	0·016	0·018	0·018	0·011

*a.* ♂. Cape of Good Hope. British Museum. Presented by Dr. Smith.

*b.* ♂. Cape of Good Hope. Paris Museum.

*c.* ♀. Cape of Good Hope. Paris Museum.

*d.* Young. Cape of Good Hope. British Museum. Type of *B. garipeensis*, Smith.

*Description.*—This is a small species, resembling greatly *B. calamita* in its physiognomy and coloration; it never exhibits, however, any trace of parotoid-like gland on the calf. Two characters which can generally be considered very important and constant, are subject here to great variation; one of them is the cutaneous tarsal fold, which is either perfectly developed or entirely absent; the other resides in the subarticular tubercles under the toes, which in most specimens are simple, in others two-rowed.

The head resembles very much that of *B. calamita*; but the interorbital space is rather broader. The nostrils are equally distant from the tip of the snout and from the anterior corners of the eyes; the space between them is rather less than that between one of them and the lip. The tympanum is very distinct, small, rounded; its diameter equals one third, or rather less, of the greatest orbital diameter. The cleft of the mouth extends to the level of the front edge of the tympanum. The tongue is generally broader than in *B. calamita*, its breadth being contained about once and half in its length. The parotoids are not very prominent, elliptic, oval, or subtriangular, and generally about twice as long as broad; but, as in most species, their proportions are subject to great variation; there is always a rather considerable space between their front edge and the upper eyelid.

The body is nearly thrice as long as the head in females, twice and a half or a little less in males.

The fore limb is nearly as long as the body in males, much

shorter and thinner in females. The fingers are short and rather pointed; the third is the longest; the fourth is somewhat shorter than the second; placed against each other, the first and second appear equally long; the subarticular tubercles are either simple, with a tendency to bipartition, or double. A large flat rounded tubercle occupies the middle of the hand, and a smaller oval one the base of the thumb.

The hind limb is short; being carried forwards along the body, the metatarsal tubercles reach the posterior corner of the eye in the males, hardly the tympanum in females. The calf is not much longer than the head, and destitute of a large gland. The cutaneous fold along the tarsus is, as above stated, either entirely absent or more or less developed, as well in adult as in young. Smith has given as a character of his *B. gariepensis* the absence of the tarsal fold; but of the two specimens which he has given to the British Museum, one exhibits it very distinctly. The large metatarsal tubercles are like those of *B. calamita*. The toes are short, depressed, webbed at the base in females, not much more in males. Of the sixteen specimens examined, four have the subarticular tubercles two-rowed, the others have them simple.

The warts of the upper surfaces are like those of *B. calamita*; the lower surfaces are smooth, except on the sides, on the lower belly, and under the thighs, where they are granular.

The upper surfaces are greyish or olive, with irregular brown or dark olive spots or marblings, which are confluent into transversal bars upon the limbs. A yellowish vertebral line, rarely absent, extends from the level of the nostrils to the vent. The lower surfaces are whitish, unspotted, or blackish-spotted in some males and young.

Males are furnished with a little-developed subgular vocal vesicle, the inner opening of which is double. Blackish rugosities cover the inner side of the first three fingers during the breeding-season.

*Geographical Distribution.*—*B. angusticeps* inhabits South Africa, where it seems to be rather abundant.

*Historic.*—The present species has been described and very well figured by Smith, in his 'Illustrations of the Zoology of South Africa,' the adult as *B. angusticeps*, the young as *B. gariepensis*. I have convinced myself, by the examination of Smith's typical specimens in the British Museum, that the two forms must be united, the difference in the shape and size of the parotoids (which is the single difference of some importance between the two forms) being in other species subject to such great variation that it cannot be considered of specific value. The specimens upon which *B. gariepensis* is founded are, besides, not adult.

This species is quite distinct from all other African Toads, though it is considered by most authors to be referable to a young state of "*B. pantherinus*."

7. *BUFO CARENS*, Smith.*Bufo carens*, Smith, Ill. Zool. S. Afr. pl. 68. f. 1 (1849).*Bufo vertebralis*, Smith, l. c. pl. 68. f. 2.*Schismaderma lateralis*, Smith, l. c. App. p. 28.*Schismaderma carens*, Günther, Cat. Batr. Sal. p. 138 (1858).

*Characters*.—Crown of the head without bony ridges. Snout short, truncated. Interorbital space broad. Tympanum very large, very distinct, rounded. Parotoids flat, indistinct. Fingers moderate, with single-rowed subarticular tubercles, first extending a little beyond second. Hind limbs moderate; no large gland on the calf; a cutaneous fold along the inner edge of the tarsus; toes moderate, half-webbed, with single-rowed subarticular tubercles. Upper parts with irregular, depressed, distinctly porous warts. Above olive darker-spotted; beneath whitish blackish-spotted. Male with a little-developed subgular vocal sac.

*Dimensions.*

	<i>a.</i>	<i>b.</i>	<i>c.</i>
	m.	m.	m.
From snout to vent.....	0·078	0·081	0·030
Length of head.....	0·021	0·020	0·008
Breadth of head.....	0·023	0·025	0·010
From eye to nostril.....	0·005	0·005	0·002
From eye to tip of snout.....	0·009	0·010	0·004
Greatest diameter of orbit.....	0·0075	0·007	0·003
Interorbital space.....	0·007	0·008	0·0025
Diameter of tympanum.....	0·0065	0·007	0·002
Body.....	0·057	0·061	0·022
Fore limb.....	0·043	0·048	0·015
Hind limb.....	0·099	0·095	0·034
Tibia.....	0·029	0·030	0·010

*a.* ♂. Natal. British Museum. Presented by Dr. Smith.

*b.* ♀. Natal. British Museum. Presented by Dr. Smith.

*c.* Young. Cape of Good Hope. British Museum. Presented by Dr. Smith. Type of *B. vertebralis*.

*Description*.—*Bufo carens* is a very remarkable species, on account of its physiognomy and the apparent absence of parotoid glands. The latter character has even been regarded as of generic value, and this species has become the type of a genus, *Schismaderma*, Smith. The parotoids, however, are not absent, as Dr. Günther has shown; and this species must evidently be placed in the neighbourhood of *B. regularis*. I cannot, therefore, admit *Schismaderma*, even as a subgenus.

The head is very short and small with regard to the trunk; the snout is vertically truncated; and the loreal regions are nearly vertical. The nostrils are about equally distant from the anterior corners of the eyes and from the tip of the snout; the space between them equals



two thirds or four fifths of that between one of them and the lip. The eyes are nearer to the angles of the jaws than they are to the tip of the snout. The interorbital space is flat and very broad, especially in females; in these its least breadth is much more than the upper eyelid's greatest breadth; it nearly equals it in males. The tympanum is more distinct than in any other species of *Bufo*, rounded and quite close to the eye; its diameter equals the greatest orbital diameter, or nearly so. The cleft of the mouth does not quite extend to the level of the centre of the tympanum. The tongue is elliptical and about twice as long as broad. In preserved specimens the parotoids are quite invisible; but, as Dr. Günther has observed, the skin of the regions where they ought to be found is much thicker; it is therefore most probable that during life flat parotoids are conspicuous.

The body is thrice as long as the head in females, shorter in males and young.

The fore limb is always shorter than the body; it is rather thicker in males than in females. The fingers are moderately elongate, with blunt tips and simple subarticular tubercles, which, however, have a tendency to bipartition; the first is a little longer than the second, which is a little shorter than the fourth. A large flat oval tubercle occupies the middle of the hand, another smaller one the base of the thumb.

The hind limb is moderately elongate; being carried forwards along the body, the metatarsal tubercles reach the eye in males, the tympanum in females and young. The tibia is much longer than the head, and deprived of a parotoid-like gland. A very distinct cutaneous fold extends along the two thirds of the inner edge of the tarsus. The metatarsal tubercles are oval, the inner one more prominent. The toes are moderately elongate; the web extends to near their tips, but is deeply emarginate; the subarticular tubercles are simple.

The body is covered above with irregular, flat, distinctly porous warts which do not exhibit any trace of spines; larger warts form a sort of chain along the sides. The lower surfaces are granular; the granules are scarcely larger beneath the thighs; they are larger on the male's throat.

The upper parts are olive, with a few dark black-circled spots; a blackish vitta, beginning behind the eye, extends on the sides of the body. The hind limbs are transversely barred with blackish. The lower surfaces are more or less vermiculated with blackish; the thighs are often blackish beneath. The young very often exhibit a light rhomboidal spot on the scapular region.

The males are furnished with a little-developed subgular vocal sac, the opening of which is double. The throat is blackish. Blackish rugosities occupy the inner surface of the first three fingers during the breeding-season.

*Geographical Distribution.*—This species has only been found in South Africa. It is rare in collections.

8. *BUFO VULGARIS*, Laurenti.

*Bufo terrestris*, Rösel, Hist. Ran. p. 85, pl. 20-21 (1758).

*Rana bufo*, Linné, Syst. Nat. 12th ed. i. p. 354 (1766).

*Rana rubeta*, Linné, l. c. p. 354.

*Bufo vulgaris*, Laurenti, Syn. Rept. p. 28 & 125 (1768); Daudin, Hist. Rain. Gren. Crap. p. 72, pl. 24 (1802); Daudin, Hist. Rept. viii. p. 139 (1803); Eichwald, Zool. spec. Ross. Polon. p. 167 (1831); Bonaparte, Faun. Ital. (1832); Bell, Brit. Rept. p. 105 (1839); Duméril & Bibron, Erp. Gén. viii. p. 671 (1841); Guichenot, Expl. Sc. Alg. Rept. p. 27 (1850); Günther, Cat. Batr. Sal. p. 55 (1858); Strauch, Mém. Ac. Sc. St. Pétersb. sér. 7. vii. p. 79 (1863); Günther, Rept. Brit. Ind. p. 419 (1864); Fatio, Vert. Suisse, iii. p. 587 (1872); Lataste, Herp. Gir. p. 283, pl. xi. (1876); Schreiber, Herp. Eur. p. 134 (1875); De Betta, Faun. Ital. Rett. Anf. p. 72 (1875); Leydig, An. Batr. p. 12 (1877); Lessona, Atti Ac. Linnei, Mem. Cl. Sc. Fis. etc. i. p. 1080, pl. iv. (1877).

*Bufo cinereus*, Schneider, Hist. Amph. f. i. p. 185 (1799); Daudin, Hist. Rain. Gren. Crap. p. 73, pl. 25 (1802); Daudin, Hist. Rept. viii. p. 141 (1803); Merrem, Syst. Amph. p. 182 (1820).

*Bufo rubeta*, Schneider, l. c. p. 227.

*Bufo roeselii*, Daudin, Hist. Rain. Gren. Crap. p. 77, pl. 27 (1802); Daudin, Hist. Rept. viii. p. 150, pl. 96 (1803).

*Bufo ventricosus*, Daudin, Hist. Rain. Gren. Crap. p. 83, pl. 30 (1802); Daudin, Hist. Rept. viii. p. 168 (1803); Merrem, Syst. Amph. p. 131 (1820).

*Bufo spinosus*, Daudin, Hist. Rept. viii. p. 199 (1803).

*Bufo palmarum*, Cuvier, Règne Anim. 2nd ed. ii. p. 109 (1829).

*Bufo colchicus*, Eichwald, Zool. spec. Ross. Polon. p. 167 (1831).

*Bufo vulgaris japonicus*, Schlegel, Faun. Japon. Rept. p. 106, pl. ii. (1833); Lataste, Le Naturaliste, 2nd year, p. 219 (1880).

*Bufo gargarizans*, Cantor, Ann. & Mag. Nat. Hist. ix. p. 483 (1842).

*Bufo commutatus*, Steenstrup, Ber. 24. Versamml. deutsch. Naturf. etc. Kiel, p. 134 (1846).

*Bufo griseus*, Hallowell, Proc. Ac. N. Sc. Philad. 1860, p. 506.

*Bufo japonicus*, Camerano, Atti Ac. Sc. Torino, xiv. p. 884 (1879).

*Characters*.—Crown of the head without bony ridges. Snout short, blunt. Interorbital space broad. Tympanum small, round, often indistinct. Parotoids elliptic, rather elongate, very prominent. Fingers rather short, with two-rowed subarticular tubercles, first extending scarcely beyond second. Hind limbs moderate; no large gland on the calf; no tarsal fold; toes moderate, at least half-webbed, with two-rowed subarticular tubercles. Upper parts with more or less prominent indistinctly porous warts. Above brown- or blackish-spotted; parotoids blackish-margined. Beneath whitish, more or less black-spotted. Male without vocal sac.

*Dimensions.*

	<i>a.</i>	<i>b.</i>	<i>c.</i>	<i>d.</i>	<i>e.</i>	<i>f.</i>	<i>g.</i>
	m.	m.	m.	m.	m.	m.	m.
From snout to vent .....	0.070	0.090	0.103	0.094	0.077	0.134	0.101
Length of head.....	0.019	0.024	0.027	0.026	0.024	0.048	0.028
Breadth of head .....	0.023	0.032	0.036	0.033	0.029	0.055	0.036
From eye to nostril .....	0.0045	0.005	0.006	0.006	0.005	0.010	0.0055
From eye to tip of snout.....	0.009	0.011	0.012	0.012	0.0105	0.019	0.012
Greatest diameter of orbit ...	0.007	0.009	0.009	0.0085	0.008	0.013	0.009
Interorbital space .....	0.007	0.008	0.009	0.008	0.007	0.014	0.010
Diameter of tympanum .....	...	...	...	...	...	0.008	0.005
Length of parotoid .....	0.013	0.017	0.021	0.019	0.016	0.026	0.018
Breadth of parotoid .....	0.0055	0.006	0.010	0.009	0.0085	0.011	0.011
Body.....	0.051	0.066	0.076	0.060	0.053	0.086	0.073
Fore limb.....	0.047	0.055	0.064	0.060	0.050	0.084	0.056
Hind limb .....	0.095	0.104	0.126	0.125	0.101	0.170	0.110
Tibia.....	0.025	0.030	0.036	0.034	0.028	0.049	0.033

- a.* ♂. Brussels. Brussels Museum.  
*b.* ♀. Geneva. Brussels Museum.  
*c.* ♀. Milan. Brussels Museum.  
*d.* ♂. Spain. Brussels Museum.  
*e.* ♂. Pekin. Brussels Museum.  
*f.* ♂. Japan. British Museum.  
*g.* ♀. Ningpo. British Museum.

*Description.*—The head is about one fourth broader than long; the snout is short and blunt, the canthus rostralis scarcely distinct. The nostrils are equally distant from the anterior angles of the eyes and the tip of the snout, or somewhat nearer the former; the space between them equals that between one of them and the lip. The eyes are nearer the tip of the snout than to the angles of the jaws. The interorbital space is flat, in some very old specimens slightly concave and broad, its least breadth being somewhat more than the upper eyelid's greatest breadth. The tympanum is generally hidden, except its front edge; it is distinct in most Japanese and some Chinese specimens; it is rounded; and its diameter equals hardly half that of the orbit. The cleft of the mouth extends much beyond the level of the posterior angles of the eyes. The tongue is elliptical, moderate, once and a half to twice as long as broad; it is generally broader in females than in males. The parotoids are elliptic, twice or twice and a half as long as broad in European and Japanese specimens, shorter and oval in the Chinese; they are very prominent, and their inner edges diverge backwards.

The body is from twice to nearly three times as long as the head.

The fore limb is as long as or slightly shorter than the body and very stout in the male, shorter and thinner in the female. The fingers are rather short and more or less pointed; the third is the longest; the second and fourth are equal and scarcely shorter than the first; the subarticular tubercles are two-rowed. There are two

large metacarpal tubercles—one on the middle of the hand, large and rounded, another at the base of the thumb, smaller and oval.

The hind limb is moderately elongate; being carried forwards along the body the metatarsal tubercles reach the eye in the male, the shoulder in the female; the tibia is considerably longer than the head and destitute of a parotoid-like gland. There is no tarsal fold. The metatarsus is provided with two large tubercles—the inner very prominent and oval, the outer flat and rounded. The toes are moderately elongate, depressed, nearly entirely webbed in the male during the breeding-season, at other times half-webbed; the subarticular tubercles are small and two-rowed.

The upper surfaces are covered with irregular, more or less prominent, often spinous warts, the pores of which are nearly quite indistinct to the naked eye; the Japanese specimens are remarkable for the greater prominence of the warts, which are very spinous; the Chinese have also the warts very prominent, but rather less spinous and more elongate, as if two warts had blended into one. The lower surfaces are granular, the granules being larger and more distant from one another on the lower belly and beneath the thighs.

The upper surfaces are brown, greyish or reddish, with irregular dark brown or blackish spots. The young and some females have the parotoids and the large warts fine brick-red. The parotoids are margined on their outer side with dark brown or black, which, in Chinese and Japanese specimens, extends as a vitta along the upper side of the flanks. The lower surfaces are dirty white, greyish or brownish, more or less spotted with blackish; these spots are very large and dark in the Asiatic specimens.

The iris is reddish, more or less vermiculated with black.

The male is furnished with blackish rugosities on the inner side of the first three fingers during the breeding-season.

Most recent authors have considered the Chinese and Japanese specimens of this Toad a distinct variety (*B. vulgaris japonicus*, Lataste), or even species (*B. japonicus*, Camerano). But none of the characters given to distinguish them from the typical form appear to me to be constant. These chief characters are the more prominent and spinous warts and the black horny layer on various parts of the body, the rather larger head, and the blackish stripe on the flanks. M. Lataste has discovered a difference in the shape and size of the liver and of the testicles in specimens from Peking. If the Japanese form should be separated from the European, it should certainly also be separated from the Chinese: but I do not think that distinction necessary; and I do not agree with M. Lataste when he says that, on the same ground upon which he has separated *Rana esculenta* of Europe from its Asiatic representative *R. marmorata*, he admits two subspecies in *B. vulgaris*, viz. *cinereus* and *japonicus*.

*Skeleton*.—The prefrontals are large, subtriangular or pear-shaped, convex, once and a half as broad as long, their inner edges in contact on their whole length. The fronto-parietals are flat, not or scarcely broader backwards than forwards, without fontanelle. The zygomatic apophysis of the temporo-mastoidians is very short.

The length of the vertebral column to the base of the coccyx equals once and a third or once and a half that of the skull. The diapophyses of the seventh and eighth vertebræ are not directed forwards; those of the ninth are moderately dilated, broader than high. The coccyx does not show any trace of diapophysis at its base, and is a little longer than the skull.

The rudiment of thumb is little developed.

*Geographical Distribution.*—*B. vulgaris* inhabits the entire Palæ-arctic Region, extending southwards to Algiers, eastwards to China and Japan.

#### 9. BUFO TUBEROSUS, Günther.

*Bufo tuberosus*, Günther, Cat. Batr. Sal. p. 60, pl. iii. f. C (1858).

*Characters.*—Crown of the head without bony ridges. Snout short, prominent, obliquely truncated. Interorbital space broad. Tympanum rather small, round, distinct. Parotoids moderate, oval, very prominent. Fingers slender, with single-rowed subarticular tubercles; first extending beyond second. Hind limbs rather elongate; no large gland on the calf; no tarsal fold; toes rather short, webbed at the base, with single-rowed subarticular tubercles. Upper parts with very prominent spinous indistinctly porous warts. Uniform brown, lighter beneath, immaculate or with indistinct spots.

#### Dimensions.

	a.	b.	c.
	m.	m.	m.
From snout to vent .....	0.065	0.071	0.025
Length of head .....	0.018	0.019	0.0075
Breadth of head .....	0.022	0.025	0.009
From eye to nostril .....	0.005	0.0055	0.0025
"      tip of snout .....	0.008	0.008	0.0045
Greatest diameter of orbit .....	0.0065	0.007	0.003
Interorbital space .....	0.006	0.0065	0.003
Diameter of tympanum .....	0.003	0.0035	0.001
Length of parotoid .....	0.011	0.013	0.004
Breadth of parotoid .....	0.007	0.007	0.002
Body .....	0.047	0.052	0.0175
Fore limb .....	0.046	0.048	0.018
Hind limb .....	0.088	0.090	0.034
Tibia .....	0.027	0.028	0.011

a. ♂. Fernando Po. British Museum. Typical specimen.

b. ♀. Loc.? British Museum.

c. Young. Gaboon. British Museum.

*Description.*—The shape of the snout of this species is quite different from that of the preceding: it is short, prominent, obliquely truncated from front to back; the canthus rostralis is rather distinct; and the loreal regions are high and vertical. The nostrils are nearer the tip of the snout than the anterior corners of the eyes; the

space between them equals that between one of them and the lip. The eyes are nearer the tip of the snout than to the angles of the jaws. The interorbital space is slightly concave; its breadth equals about that of the upper eyelid. The tympanum is distinct, rounded, or a little higher than broad; its diameter equals about half the greatest orbital diameter. The cleft of the mouth extends to the level of the centre of the tympanum. The tongue is elliptical, narrow; its breadth contained twice in the female, twice and a half in the male, in its length. The parotoids are very prominent, oval, oblique, divergent backwards; their breadth is contained hardly twice in their length; they begin at a rather considerable distance behind the upper eyelids.

The body is about twice and a half as long as the head.

The fore limb is as long as the body in the male, scarcely shorter in the female. The fingers are long and slender; the first equals the third and is much longer than the second, which is a little longer than the fourth; the subarticular tubercles are simple, and larger and more prominent than in any other species of *Bufo* I have seen. A large rounded tubercle occupies the middle of the hand, and another, smaller and oval, the base of the thumb.

The hind limb is slender; being carried forwards along the body the metatarsal tubercles reach the tip of the snout in the male, between the eye and the nostril in the female; the tibia is much longer than the head and does not show any trace of parotoidiform gland. The inner edge of the tarsus is tuberculous. The first cuneiform tubercle is moderate, oval, rather prominent; the other metatarsal tubercle is rounded, and not very distinct from the other large tubercles that surround it. The toes are rather short; the fourth is rather more than one third longer than the third, which is scarcely longer than the fifth; they are webbed at the base; the subarticular tubercles are large, prominent, and single-rowed.

The integument is most peculiar. Above, the warts are very prominent, the larger ones composed of a central, conical, spine-bearing tubercle surrounded by several others; the parotoids are very rough. The lower surfaces are covered with minute granules intermixed with larger spinous ones.

The upper surfaces are brown, uniform in the adult, with a few angular symmetrical blackish spots on the head and body and across the limbs in the young. The lower surfaces are lighter, with some indistinct traces of dark spots in the male.

The male has no vocal sac.

*Geographical Distribution.*—*Bufo tuberosus* inhabits West Africa. It is very rare in collections.

#### 10. BUFO TAITANUS, Peters.

This species has been lately described by Prof. Peters (Monatsb. Berl. Acad. 1878, p. 208, pl. ii. f. 9) from a young specimen. It seems to be distinct from all other African *Bufo*nes, being most closely allied to *B. tuberosus*. Not having seen the animal, I will reproduce the diagnosis given by Prof. Peters.

"Crown of the head flat; snout rather prominent, as long as the diameter of the eye; canthus rostralis distinct; nostril lateral and beneath the latter; at the end of the snout a linear furrow. Body slender; parotids flat and elongate; tympanum hidden; temporal region, back, and sides covered with prominent warts; beneath finely granulate. Fingers and toes short; the latter shortly webbed. No tarsal fold; palm with one, sole with two small tubercles."

"Dark yellowish brown, with irregular longitudinal and transversal black spots. Limbs irregularly barred. Belly brownish yellow, marbled and spotted with black."

"Total length 0.030 m., length of head 0.008, breadth of head 0.009, fore limb 0.018, hand (to the tip of the third finger) 0.006, hind limb 0.028, foot (to the tip of the fourth toe) 0.083."

*Hub.* Taita (East Africa).

Brussels, July 31, 1880.

#### EXPLANATION OF THE PLATES.

##### PLATE L.

- |    |                             |           |  |
|----|-----------------------------|-----------|--|
| a. | <i>Bufo viridis</i> ♀.      | Noukouss. | M. Lataste's collection.                       |
| b. | Upper surface of head of ♀. |           |  |
| c. | " "                         | ♂.        | Mangyschlak. { From the St. Petersburg Museum. |
| d. | " "                         | ♂.        | Copenhagen. Brussels Museum.                   |

##### PLATE LI.

- |    |                             |          |   |
|----|-----------------------------|----------|---|
| a. | <i>Bufo mauritanicus</i> ♀. | Algiers. | M. Lataste's collection.                            |
| b. | " "                         | ♂.       | Skull from above. Algiers. M. Lataste's collection. |

##### PLATE LII.

*Bufo regularis*, var. B, ♀. Cape of Good Hope. Paris Museum.

## 2. A List of the Birds of the Island of Ruk in the Central Carolines. By OTTO FINSCH, Ph.D., C.M.Z.S., &c.

[Received August 12, 1880.]

Ruk, Rug, or, as the natives call it, more correctly, Tug (Hogoleu of the older charts), is the most important island of the Central Carolines. It consists of several low and high islands, surrounded by a barrier-reef. Of these islands Tol and Ruk are the largest and highest. The zoology of this group of islands is very limited; and, if I am right, Hombron and Jacquinot are the only naturalists who have examined it. The 'Voyage au Pôle Sud,' however, gives us only three species of birds as occurring there—namely, *Drymophila rugensis*, *Myiagra oceanica*, and *Calamoherpe syriax*; and no other additions have been made since. During my stay on Ponapé it was my privilege to inspect a considerable series of birds collected by Mr. J. Kubary, who spent fourteen months in investigations and collections on this island. I have thought it useful to give a short

notice of this collection—the more so as Mr. Kubary has kindly furnished me with a list of all the species observed or obtained by him; so that the following list will contain a full enumeration of the birds of Ruk. Of the total number of 29 species, only two are peculiar to the islands (*Drymophila rugensis* and *Myiagra oceanica*). The species marked in the subjoined list with an asterisk I did not inspect myself, but insert on the authority of Mr. J. Kubary.

1. COLLOCALIA VANICORENSIS (Quoy & Gaim.).

Agrees in every respect with specimens from the Palaos and Kushai.

2. MYZOMELA RUBRATRA (Less.).

Agrees with Ponapé specimens.

3. CALAMOHERPE SYRINX, Kittl.

Agrees with Ponapé specimens.

4. ZOSTEROPS SEMPERI, Hartl.

Exactly like specimens from Ponapé.

5. METABOLUS RUGENSIS.

*Coluricincla rugensis*, Jacq. et Puch. Voy. Pôle Sud, iii. p. 62; Atlas, t. 13.

*Metabolus rugensis*, Bp. C. R. xxxviii. p. 650 (1854).

Native name "Uua."

The adult males of this species in full dress (in July) are of a silky white, with the front, lores, lower part of cheeks, chin, and throat of a dark shining black. In August the same birds are of a uniform dull sooty black. Young males and females (in July and August) are above bright cinnamon-colour, darkest on the wings and tail; below of a light pale rusty colour, passing into whitish in the female, and of a nearly isabelline-white in the male. From this dress the latter change into that of the old male, as one specimen before me already shows the development of the black face.

*Young females* change from the cinnamon into the black garb.

Mr. Kubary also found nests and eggs of this species, of which I have examined specimens. The nest is of a distinctly cup-shaped form, about  $1\frac{1}{2}$  inch deep by nearly 3 inches in diameter; the walls are thick, and consist entirely of fine halms of grass and fibres. The nests are placed in forked branches of trees, and contain one or two eggs. The latter are cream-coloured, speckled all over with rufous, which at the large end are confluent, and cover this part all over with rufous speckles. Some eggs have more of a pale reddish ground-colour.

6. MYIAGRA OCEANICA, Jacq. et Puch. Voy. Pôle Sud, Zool. iii. p. 77; Atlas, pl. 12 bis, f. 1 & 2.

The nest and eggs were obtained by Mr. Kubary. The former



resembles that of *M. pluto* from Ponapé. It is cup-shaped, 12''' deep by 20''' to 24''' in diameter, and consists of fine grass fibres, &c., covered all over outside with moss and lichen. The egg (c. 10''' long) is of a shining cream-colour, passing faintly into isabel-line. A little above the centre, towards the larger end, there is a broad ring of reddish-brown spots, which are confluent and are mixed with some greyish ones; the remaining portion of the egg has a few reddish speckles. The nest is placed on the branches of trees, and contains mostly a single egg, seldom two. The breeding-season is nearly the whole year through. I inspected eggs collected in May, June, and August.

This is a very good species, and by no means identical with *M. albiventris*, Peale, as was suggested by us (Ornith. Centralpolyn. p. 93). I add a short description:—

*Male*. Upper parts slate-grey; wing and tail darker, of a brownish black; head above with steel-black lustre; underparts white; chin pale; throat and upper part of a bright rust-red.

*Female*. Like the male, but paler; above smoky brown; head above the same, underneath with only the throat washed with rufous-yellow.

Long. al.	caud.	rostr.	Lat. rostr.	Long. tars.
3''	2'' 7'''	6'''	4'''	9'''

This species is much larger than *M. albiventris*; the latter has only the chin and throat vivid rufous-red and the upper parts black.

#### 7. CALORNIS PACIFICUS (Gm.).

Specimens from Ruk agree with others from Ponapé and Kushai, although some look apparently a little more shining. A young male has the feathers of the underparts from below the throat distinctly margined on the sides with whitish, forming light longitudinal stripes, as I described in Palau specimens.

#### \*8. ERYTHRURA TRICHROA (Kittl.).

#### 9. PTILOPUS PONAPENSIS, Finsch.

Agrees with Ponapé specimens.

#### \*10. CARPOPHAGA OCEANICA, Less.

#### 11. PHLOGENAS ERYTHROPTERA (Gm.).

Agrees with specimens from Ponapé.

#### \*12. STREPSILAS INTERPRES, L.

#### \*13. CHARADRIUS FULVUS, Gm.

#### 14. NUMENIUS PHAEOPUS, L.

This is perhaps rather *N. uropygialis*, as the specimens have a dark-barred rump.

#### \*15. ACTITIS INCANA (Gm.).

- \*16. *ARDEA SACRA*, Gm.
- 17. *ARDEA SINENSIS*, L.
- 18. *NYCTICORAX MANILLENSIS*, Vig.
- 19. *ORTYGOMETRA CINEREA*, Vieill.

This species breeds on Ruk. The nest is placed in the grass on swampy ground, and contains but two eggs. The latter (14''' long, 11''' diameter) are speckled all over minutely with pale rufous-brown on a pale yellowish-rufous ground.

- \*20. *STERNA BERGII*, Licht.
- \*21. *STERNA MELANAUCHEN*, Temm.
- 22. *ANOUS STOLIDUS* (L.).  
Agrees with specimens from Ponapé and Kushai.
- 23. *ANOUS MELANOGENYS* (Gm.).
- \*24. *GYGIS ALBA* (Sparrm.).
- \*25. *PUFFINUS OBSCURUS* (Gm.).
- \*26. *PHAETON CANDIDUS*, Briss.
- \*27. *PHAETON RUBRICAUDA*, Briss.
- \*28. *TACHYPETES AQUILA*, L.
- \*29. *DYSPORUS SULA*, L.

3. On two Species of Pigeons from the Caroline Islands.  
By OTTO FINSCH, M.D., C.M.Z.S., &c., late Director  
of the Zoological Museum of Bremen.

[Received August 12, 1880.]

1. *PTILOPUS HERNSHEIMI*, sp. nov.

*Diagn.* Like *P. fuscatus*, but without any marked pectoral or ventral spot; lower part of breast and sides of vent of a uniform grass-green.

*Hab.* Kuschai (Strong Island, Ualan).

Kittlitz long ago mentioned a small Pigeon as observed by him on the island of Ualan, which he did not obtain. It is now my privilege to be the first naturalist to report on this species; and, after a careful investigation, I feel no doubt as to its specific distinctness, and have given above its chief characteristic differences from its nearest ally. I may remark that I have been able to compare ten specimens. These all correspond in wanting the pectoral spot, which is a well-marked feature and very significant in distinguishing

these localized species. The absence of any reddish-purple cross mark on the gular feathers, the red cap, and the general coloration are the same as in *P. fasciatus*; but the tail-feathers have a deep-yellow apical band about 22 millims. in breadth.

I have the pleasure of naming this species after Mr. Franz Hensheim, Imperial German Consul at Jaluit (Marshall group), as a slight token of my personal affection, and of my thankfulness for the great help he has rendered to my scientific undertakings throughout my stay in the South Seas.

## 2. *PTILOPUS PONAPENSIS*, Finsch, P. Z. S. 1877, p. 779.

During my stay on the island of Ponapé I had the pleasure of examining a considerable series of specimens of this species, and may state that I found the diagnostic characters previously given quite constant, but that to them there should be added the following:—"A distinct dark-green ventral spot, changing in certain lights into dark violet." This ventral spot is always present, and occurs in both sexes.

I should likewise say that *Pt. ponapensis* is not confined to the island of Ponapé, but inhabits also the Ruk group (Hogoleu). Specimens collected by Mr. Kubary at the latter island agree in every respect with those from Ponapé.

## 4. On the Genus *Myodora* of Gray.

By EDGAR A. SMITH.

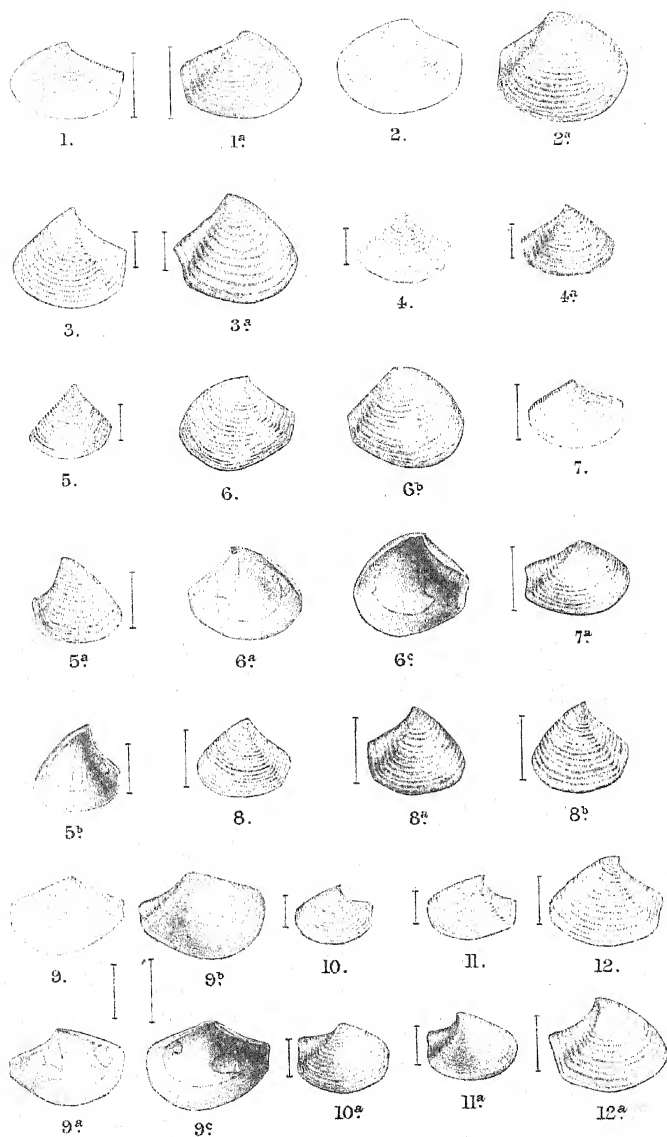
[Received September 2, 1880.]

(Plate LIII.)

This genus was indicated by Gray in the 'Synopsis of the Contents of the British Museum' published in 1840, and in the 'Annals of Natural History' for the same year. In the latter work the name is printed *Myadora*, and in like manner on p. 136 of the former. Further on, however, on p. 150 in the same work, it is written *Myodora*; and in the Proc. Zool. Soc. for 1847, p. 191, the author also employs the latter spelling. This orthographic discrepancy is probably due to the printer's misreading of Gray's manuscript; for he was no calligrapher.

In the last-mentioned work Gray questions Reeve's propriety in quoting *Myadora* as of Gray. On this account, and seeing that he himself there adopts the other spelling and that it has been more generally used by authors, although not the first actually published, I shall employ the same word in the present monograph.

Considerable difference of opinion appears to have existed as to which is the right valve of shells belonging to this genus and which the left. Reeve, Philippi, Chenu, and Woods call the flat valve the right and the deep one the left. On the contrary, Woodward, Gould, and Hutton (copying Woodward) say the left is flat and the





right deep or convex. An equal amount of uncertainty prevails respecting the anterior and posterior ends of the shell. Reeve, Woods, and Hanley describe the former as truncated and the latter as rounded. On the other hand, Woodward, Adams, Gould, Philippi, and Hutton, hold a precisely opposite opinion respecting these parts.

In this genus it is a constant character that one valve is flatter than the other; and in the description of the following new species the terms "flat valve" and "deep valve" will be employed, thus removing all doubt respecting which valve is spoken of; and the truncated end, or, in other words, that towards which the beaks incline, will be termed the posterior extremity, and the opposite curved end the anterior.

#### *Generic Characters of Myodora.*

Animal unknown. Shell inequivalve; one valve flattish, the other convex; white, more or less truncated at the posterior extremity, rounded in front, concentrically sulcated. Hinge composed of the sharply reflexed dorsal margins of the flat valve, forming pseudolateral teeth, which fit into corresponding elongate grooves in the deep valve. Cardinal teeth none. Ligament internal, situated in a triangular space beneath the umbones, and supported (probably always) by a free shelly structure termed the clavicle. Exterior of valves sculptured with microscopic concentric striæ, interrupted by others radiating from the umbones. Interior more or less nacreous, marked with one or more impressed rays curving from the umbones towards the ventral margin. Pallial impression with a small sinus.

#### Genus MYODORA.

*Myadora*, Gray, Ann. Nat. Hist. 1840, p. 306; id. Synopsis Brit. Mus. 1840, p. 136.

*Myodora*, Gray, Synopsis, p. 150; id. P. Z. S. 1847, p. 191.

*Myadora*, Reeve, Con. Icon., Monograph; id. P. Z. S. 1844, p. 91; Woodward, Man. Moll. p. 499.

*Myodora*, Hanley, Cat. Rec. Bivalve Shells, p. 338; H. & A. Adams, Gen. Rec. Moll. vol. ii. p. 371; Conrad, Amer. Journ. Conch. vol. iv. Appendix, p. 71; Chenu, Man. de Conch. vol. ii. p. 51; Philippi, Handbuch der Conch. u. Malacozool. p. 322.

*Pandora*, Quoy & Gaimard, Voy. Astrolabe, Zool. vol. iii. p. 537 (*striata*); Sowerby, Appendix to Stutchbury's Sale Cat. p. 3 (*brevis*).

*Anatina*, Stutchbury, Zool. Journ. vol. v. p. 99, 100 (*brevis*, *pandoriformis*, *crassa*, *ovulis*).

#### 1. MYODORA STRIATA (Quoy & Gaimard).

*Pandora striata*, Quoy & Gaimard, Voy. Astrolabe, Zool. vol. iii. p. 537, pl. 83. f. 10; Jay, Cat. Shells, ed. 3, p. 120, pl. 6. f. 6, 7.

*Myadora striata*, Gray, MSS., Reeve, Con. Icon. f. 6-6c; id. P. Z. S. 1844, p. 93.

*Myodora striata*, Deshayes, Chenu, Man. de Conch. vol. ii. p. 52, fig. 215.

*Myodora striata*, Q. & G., Hanley, Cat. Biv. Sh. pl. 12. f. 12.

*M. brevis*, Woodward, non Sowerby, Manual Moll. pl. 23. f. 12.

*Hab.* New Zealand. "Common in the north, rare in the south, Dunedin" (*Hutton*, Manual of N.Z. Mollusca, p. 137).

This is the largest species of the genus. The concentric striæ on the flat valve are comparatively fine, and generally less conspicuous than as represented by the figures in the 'Astrolabe' and the 'Conchologia Iconica,' the latter depicting a shell with the angle formed by the dorsal margins exceptionally acute. The sculpture of the deep valve is rather coarser than that of the other valve.

## 2. MYODORA ROTUNDATA, Sowerby.

*Myodora rotundata*, Sowerby, P. Z. S. 1875, p. 129, pl. 24. f. 8.

*Myodora rotunda*, Hutton (as of Sowerby), Manual N.Z. Moll. 1880, p. 137.

*Hab.* New Zealand.

This species differs from *M. striata* in having the convex or deep valve much deeper, the hinder dorsal margin proportionally shorter, less incurved and more sloping, the ligamental pit much smaller, and the contour of the shell more rounded.

## 3. MYODORA BREVIS (Sowerby).

*Pandora brevis*, Sowerby, Appendix to Stutchbury's Sale Cat. p. 3, pl. f. 2.

*Anatina brevis*, Stutchbury, Zool. Journ. v. p. 99, tab. Suppl. 43. f. 1, 2.

*Myadora brevis*, Reeve, P. Z. S. 1844, p. 93; id. Con. Icon. f. 7a-b; Hanley, Rec. Biv. Shells, pl. 10. f. 13; Chenu, Man. de Conch. vol. ii. p. 52, fig. 217.

Non *M. brevis*, Woodward, Man. Moll. pl. 23. f. 12, = *M. striata*.

Non *M. brevis*, H. & A. Adams, Gen. Rec. Moll. vol. iii. pl. 98. f. 2-2a, = *M. pandoriformis*.

*Hab.* Port Jackson (*Stutchbury & Brenchley*); Lane Cove, Farm Cove, and Mossman's Bay (*Angas*, P. Z. S. 1867); Cape Upstart (*Mus. Cuming*); New Zealand (*Bolton*); Stewart Island (*C. Traill*); Tasmania (*R. Gunn*).

The form of this species is subject to considerable variation. This may be seen by comparing the figure in the Stutchbury Sale Catalogue with that in the 'Zoological Journal.' The series of specimens in the Museum, too, indicate how variable the species is with regard to outline, the apical angle in some being much more acute than in others.

The microscopic sculpture consists of a very minute granulation, the granules being of unequal sizes and frequently transversely oblong. This granulation is coarser than in the other species of the genus; and the almost total absence of the radiating microscopic lines obtaining in all of them is remarkable.

The Tasmanian specimens are peculiar on account of the greater coarseness of the concentric raised ridges; but in other respects

they agree with the normal Australian form, except that the umbonal angle is rather less acute.

#### 4. MYODORA PANDORIFORMIS (Stutchbury).

*Anatina pandoriformis*, Stutchbury, Zool. Journ. v. p. 99, tab. Suppl. 43. f. 3-4.

*Myodora pandoriformis*, Hanley, Rec. Biv. pl. 10. f. 9.

*M. pandoræformis*, Reeve, Con. Icon. f. 10; id. P. Z. S. 1844, p. 93.

*M. brevis*, H. & A. Adams (non Sowerby), Gen. Moll. vol. iii. pl. 98. f. 2, 2a.

*Hab.* Port Jackson (*Stutchbury & Macgillivray*); Middle Harbour (*Angas*); Sydney Heads, 15 fathoms (*Brenchley*); Port Philip (*Brit. Mus.*); Stewart Island (*C. Traill*).

This species is easily recognized from the others by its transversely elongate form, its comparative smoothness, and the excessive fineness of the microscopic sculpture.

#### 5. MYODORA CRASSA (Stutchbury).

*Anatina crassa*, Stutchbury, Zool. Journ. v. p. 100, tab. Suppl. 43. f. 5-6.

*Myodora crassa*, Hanley, Rec. Biv. pl. 10. f. 6; Reeve, Con. Icon. f. 1; id. P. Z. S. 1844, p. 92.

*Hab.* Port Jackson (*Stutchbury, Macgillivray, King*); Middle Harbour (*Angas*, P. Z. S. 1867); Stewart Island (*C. Traill*).

This species is remarkable for its solidity and its flat valve being less flattened or concave than in other species of the genus.

#### 6. MYODORA OVALIS (Stutchbury).

*Anatina ovalis*, Stutchbury, Zool. Journ. v. p. 100, tab. Suppl. 43. f. 7-8.

*Myodora ovalis*, Hanley, Rec. Biv. pl. 9. f. 53.

*Hab.* Port Jackson.

This species, judging from the figure, appears to belong to this genus. It is omitted by Reeve in his Monograph, by Conrad in his Catalogue in the fourth volume of the 'American Journal of Conchology,' and by Angas in his list of the shells of New South Wales. Stutchbury's description runs thus:—"Shell inæquivalve, thin, pellucid, posterior side truncated; right valve convex, superior margin sulcated, receiving the inflated edge of the other valve; left valve slightly convex. Hinge with an oblique elongate internal cartilage. Sinus of the impression of the mantle large."

The figure is rather like that of *Myodora pandoriformis* as regards form; but the sculpture of the deep valve appears finer. The pallial sinus is said to be large, which is hardly descriptive of that in *pandoriformis*, or, indeed, of any species of the genus. Indeed, this fact and its "thin, pellucid" substance suggest the possibility of its belonging to another group—*Thracia*?



## 7. MYODORA OBLONGA, Reeve. (Plate LIII. figs. 1, 1a.)

*Myodora oblonga*, Reeve, Con. Icon. f. 8; id. P. Z. S. 1844, p. 93.

*M. curvata*, Reeve, l. c. f. 9; id. P. Z. S. 1844, p. 93.

*Hab.* Mindoro Island, Philippines, and Corrigidor Islands.

On comparison of the types of these two so-called species I fail to observe any real distinctive characters; indeed I might say they are almost identical. I may add, too, that the figure of *M. curvata* is incorrect; the anterior dorsal slope should be less curved, and the hinder end not produced to such a point.

This species is more elongate transversely than *M. ovata*; its sculpture is scarcely so coarse, and is not interrupted or obsolete on the posterior depressed areas of the valves; indeed, upon the margins the terminations of the plicæ are quite prominent.

## 8. MYODORA OVATA, Reeve. (Plate LIII. figs. 2, 2a.)

*Myodora ovata*, Reeve, Con. Icon. f. 4; P. Z. S. 1844, p. 92; Chenu, Man. de Conch. vol. ii. p. 52, f. 216.

*Hab.* Zebu, Philippine Islands (*Cuning*); Port Jackson and Port Adelaide (*Angas*); New Zealand (*Hutton*).

In the description of this species the right valve is said to be "slightly convex." This is incorrect, and should be "slightly concave;" for all the specimens, including the type itself, agree in this respect.

The hinder end of the convex or lower valve has a faint ridge running from the umbo to the lower angle of the truncated end; and upon the portion of the surface parted off by it the coarse concentric plicæ are all but obsolete. The corresponding end of the other valve too exhibits a similar space upon which the concentric sculpture is more feebly expressed; this portion of the valve is rather excavated. The microscopic sculpture of the deep valve is a trifle finer than that of the flattened one, the radiating minute thread-like lines upon the latter being a little more remote from one another.

## 9. MYODORA TRIGONA, Reeve. (Plate LIII. figs. 3, 3a.)

*Myodora trigona*, Reeve, Con. Icon. f. 2; P. Z. S. 1844, p. 92.

*M. tineta*, Reeve, l. c. f. 5; P. Z. S. 1844, p. 93.

*Hab.* Islands of Luzon and Ticao, Philippines.

On comparing the types of the two species described by Reeve under the above names, I have come to the conclusion that they are not specifically distinct. *M. tineta*, judging from the description, merely offers a difference of colour. It is said to be "stained with light brown," a feature common to all the other species represented on the same plate. The form is almost exactly the same as the young of *M. oblonga*; but the sculpture is finer.

## 10. MYODORA PLANA, Reeve. (Plate LIII. figs. 4, 4a.)

*Myodora plana*, Reeve, Con. Icon. f. 3 a-b; P. Z. S. 1844, p. 92.

*Hab.* Island of Bohol, Philippines.

This form is scarcely separable from *M. trigona*. It is, however, a trifle more oblong, with the apical angle hardly as acute and the concentric ridges of the deep valve fewer and more distant.

#### 11. MYODORA FLUCTUOSA, Gould.

*Myodora fluctuosa*, Gould, Proc. Bost. Soc. Nat. Hist. 1861, vol. viii.; Otia Conch. p. 161.

*Hab.* Japan, Kagosima Bay.

This species is known to me only by Gould's description, which runs thus:—"T. parva, tenuis, albida, umbonibus fere medianis: valv. dextra convexa, postice *triangularis*, apice truncata, undulis concentricis circ. 20 ad margines haud protractis ornata; (valva sinistra ignota;) cardo debilis, dentibus elongatis. Long. 8, alt. 7, lat. 3 millim."

#### 12. MYODORA CONVEXA, Angas.

*Myodora convexa*, Angas, Proc. Zool. Soc. 1865, p. 57, pl. ii. f. 13-14.

*Hab.* New Caledonia.

This species, as its name implies, has the deep valve very convex. It is of a rather rounded form and finely regularly lirate.

#### 13. MYODORA TASMANICA, Woods.

*Myodora tasmanica*, Woods, Proc. Roy. Soc. Tasm. 1875, p. 160.

"*Testa albida, curvato-oblonga, antice leviter flexuosa, abrupte truncata, valva sinistra ventricosa-convexa, dextera distincte concava; concentric striata; striis paucis, rotundatis, latiusculis, subdistantibus, regulariter crescentibus; sub lente elegantissime, tenuissime decussata. Long. 17, lat. 13, alt. 4 mill.*"

*Hab.* Long Bay, Tasmania.

"This very distinct species of *Myodora* has more affinities with the Australian *M. pandoraformis* than any other; but it has no movable testaceous appendage, and the valves are both distinctly striately ridged" (*Woods*).

The above description applies exactly to *M. ovata*, which, however, is said to be from the Philippine Islands.

#### 14. MYODORA ALBIDA, Woods.

*Myodora albida*, Woods, Proc. Roy. Soc. Tasman. 1875, p. 160.

"*M. testa alba, translucida, subquadrate oblonga, subconvexa, antice latissime truncata; concentric striata; striis elevatis, rotundatis, regularibus, paucis, prope marginem anticum angulatis. Long. 10, lat. 6, alt. 2 mill.*"

*Hab.* Long Bay, Tasmania.

"A very pretty species, differing from the last in its subquadrate form and its convex valves, which are both regularly and distinctly striate" (*Woods*).

15. *MYODORA NOVÆ-ZEALANDIÆ*, sp. nov. (Plate LIII. figs. 5, 5a, 5b.)

Shell inequilateral, subequilaterally triangular; deep valve considerably convex, with an indistinct shallow groove posteriorly near the margin, concentrically rather coarsely sulcated, the sulci extending from the front margin to near the posterior side, where they suddenly stop, leaving a smooth narrow space between their termination and the edge, or, in other words, a plain posterior dorsal area. The front dorsal margin is nearly straight and a trifle longer than the posterior, the latter being feebly incurved; ventral margin arcuate. Interior pearly, marked with two subparallel or slightly diverging rays or striæ, radiating from the umbo a little beyond the centre of the valve. Flat valve a trifle concave, with much finer concentric sculpture than the other valve; anterior dorsal margin straight, acute.

Length from apex to ventral margin  $8\frac{1}{2}$  millims., width  $9\frac{1}{2}$ .

*Hab.* Stewart Island (*C. Traill*); New Zealand.

This species is more equilaterally triangular than any other in the genus, and is remarkable for the abrupt termination of the concentric grooves on the deep valve, the smooth posterior dorsal area, and particularly for the two divergent impressed rays within both of the valves radiating from the umbones as far as the pallial impression. The sinus in the latter is rather deep; and the hinder muscular scar is higher up or nearer the umbo than the anterior one. The shallow depression or groove proceeding down the hinder side of the deep valve is near the margin, and very conspicuous.

16. *MYODORA SUBROSTRATA*, sp. nov. (Plate LIII. figs. 6, 6a, 6b, 6c.)

Shell subtrigonally ovate, posteriorly rather acuminate and scarcely truncated at the extremity, anteriorly sharply curved; ventral margin curved and feebly sinuated posteriorly, giving the shell a somewhat rostrated appearance. Deep valve moderately convex (in young specimens much flatter), with only a trace of a shallow depression down the posterior side; its hinder dorsal margin almost rectilinear, the anterior much arcuated; concentric sulci rather coarse, generally continued to the margins. Other valve quite flat, with finer sculpture. Hinge-cartilage furnished with a small pellucid clavicle. Interior with a single impressed ray, curving from the umbones to the sinus in the pallial impression in the flat valve, and further within the valve in the deep one. Anterior scar somewhat elongated, posterior more circular.

Length  $14\frac{1}{2}$  millims., width 18, diameter 5.

*Hab.* New Zealand (*Colonel Bolton & Mus. Cuming*); Stewart Island (*C. Traill*).

This species may have been confounded with *M. ovata*, which is included by Hutton among the species of this genus said to be found at New Zealand.

*M. ovata* is not so narrowed posteriorly, is broadly truncated, and more elongated transversely. Its sculpture too is coarser; and the apical angle formed by the convergence of the dorsal slopes is

not so acute. The present species is more broadly and deeply sulcated than *M. striata*, and of a different form, the hinder dorsal slope being straighter and the anterior more curved. The deep valve has not the elevated and strongly sculptured hinder marginal ridge which is so characteristic of that species.

17. *MYODORA ANTIPODUM*, sp. nov. (Plate LIII. figs. 7, 7a.)

Shell transversely elongate, broadly truncated behind, acuminate curved at the opposite extremity. Anterior dorsal slope shorter than the posterior, considerably oblique, rectilinear, hinder margin feebly incurved. Deep valve rather shallow, concentrically liræ; liræ thickest near the anterior side, and less distinct posteriorly. In the latter region a ridge runs from the umbo to the lower end of the truncation; and between this and the dorsal margin the surface is concave. Flat valve very slightly concave, concentrically, finely, and shallowly sulcate, the interstices on the front dorsal margin being raised and prominent. Interior of valves with a single impressed ray, curving from the umbones to the lateral boundary of the pallial sinus. The latter is broad and not deep.

Length 9 millims., width  $13\frac{1}{2}$ , diam. 2.

*Hab.* New Zealand (*Col. Bolton, R.E.*).

This species may be known from *M. boltoni* by the broader posterior truncated end, and the fact of the hinder dorsal slope being longer than the anterior, whilst in that species it is the reverse. The sculpture of the deep valve too is coarser, and the pallial sinus broader and not so deep; and the impressed ray meets the latter at a different point. *M. pandoriformis* has a curved front dorsal margin, is more equilateral, its deep valve more convex; and the form is deeper from the umbones to the ventral margin.

18. *MYODORA BOLTONI*, sp. nov. (Plate LIII. figs. 9, 9a, 9b, 9c.)

Shell transversely elongated, much narrowed posteriorly, and obliquely truncated at the end, broad and curved at the other extremity. Anterior dorsal margin very slightly oblique, rectilinear, posterior a little incurved, a trifle shorter than the other. Lower or deep valve moderately convex, with a raised ridge from the umbo to the lower end of the truncated extremity, and with a depression between it and the raised margin. Surface almost smooth, with the exception of the posterior end, which is distinctly sulcated, especially upon the raised ridge and the margin. Upper or flat valve somewhat concave, finely concentrically striated. Interior of valves with a single impressed ray curving from the umbones to the upper boundary of the pallial sinus. The latter is conspicuously deep. Hinge-clavicle present.

Length 9 millims., width  $14\frac{1}{2}$ , diam. 3.

*Hab.* New Zealand (*Colonel Bolton, R.E.*).

This species can hardly be compared to any of the known forms. *M. pandoriformis* is more like it than any other; but that is more strongly sulcated, more broadly truncated posteriorly, more

curved on the anterior dorsal margin, and the pallial sinus is much less deep.

The microscopic radiating striae on the present species are very conspicuous.

19. MYODORA PROXIMA, sp. nov. (Plate LIII. figs. 8, 8a, 8b.)

*M. triangularis*, A. Ad. MS. in Mus. Cuming.

Shell subequilateral, triangular, thick; dorsal lines converging to a sharp point, anterior a little convexly curved, posterior a trifle concave near the umbones; anterior and hinder ends rather sharply rounded, subangular, the latter *sometimes* more or less obliquely truncated; ventral margin broadly arcuate. Deep valve not very convex, with only a trace of a depression down the posterior side, rather coarsely lirate from margin to margin; upper valve flat or very slightly convex, sulcated very nearly as coarsely as the other valve. A single impressed ray in the interior, curving from near the umbones to the inner or lateral boundary of the small pallial sinus in the flat valve, and nearer the centre in the deep one. Posterior scar subrotund; anterior one more elongate, subpyriform.

Length 10 millims., width  $10\frac{1}{2}$ , diam. 3.

*Hab.* Japan, 22-47 fathoms (*Capt. H. C. St. John, R.N.*); China (*Mus. Cuming*).

This species approximates very closely to *M. trigona* from the Philippine Islands. It may, however, be specifically separated on account of the more acute apical angle, its greater depth from the umbo to the ventral margin, the less-distinct posterior depression on the convex valve, the slighter truncation of hinder margin, and the less regularity and less elevation of the concentric ridges.

20. MYODORA REEVEANA, sp. nov. (Plate LIII. figs. 10, 10a.)

*M. reeveana*, A. Adams, MS. in Mus. Cuming.

Shell transversely ovate, posteriorly broadly truncated, anteriorly rounded, subequilateral; front dorsal slope of deep valve nearly rectilinear, only feebly arcuate, hinder rather incurved; concentric ridges very fine, continuous from margin to margin; upper valve flat, with a slight depression down the posterior side, finely concentrically striated. Internal impressed ray a little curved, extending to the inner side of the pallial sinus.

Length  $5\frac{1}{3}$  millims., width  $7\frac{1}{2}$ , diam. 2.

*Hab.* China.

This species is remarkable for the fine concentric sculpture, in which respect it differs from its congeners. *M. convexa* is lirate nearly as finely, but differs in form. Young specimens of *M. pandoriformis* would probably agree very fairly in the latter character; but their concentric liræ are much too remote.

The truncation at the posterior end is very abrupt in this species, and forms almost a right angle with the hinder dorsal slope. The microscopic sculpture is excessively fine in comparison with that of other species.

## 21. MYODORA TENUISCULPTA, sp. nov. (Plate LIII. figs. 11, 11a.)

Shell thin, inequilateral, abruptly truncated behind, and sharply rounded at the other end; anterior dorsal slope rectilinear, longer than the posterior; the latter is remarkably incurved. Deep valve only slightly convex, with a very feeble depression posteriorly, and with very shallow concentric sulci, scarcely apparent to the naked eye. Flat valve a trifle concave, concentrically finely striated. Impressed ray of the interior curved, meeting the inner boundary of the mantle-impression in the flat valve and falling a little further within in the deep valve. Posterior scar subrotund; anterior elongate, much narrower.

Length 5 millims., width 7, diam.  $1\frac{1}{4}$ .

Hab. —?

This is the most finely sculptured species in the genus, and is less equilateral than *M. reeveana*.

## 22. MYODORA COMPRESSA, sp. nov. (Plate LIII. figs. 12, 12a.)

Shell compressed, rather thin, subtrigonal, posteriorly obliquely truncated, acutely rounded in front. Hinder dorsal slope rather incurved, shorter than the anterior, the latter being nearly rectilinear. Ventral curve slight. Lower or deep valve very shallow, with a feeble depression posteriorly near the margin, and marked with shallow concentric sulci and striæ, the interstitial ridges being most prominent at a short distance from the hinder extremity, or, in other words, on that part of the surface which bounds the depression. Angle formed by the truncated end and the dorsal margin rather abrupt, of about 90 degrees. Upper valve flat, with a shallow depression posteriorly, finely concentrically striated. Impressed ray of the interior curved a little, extending in the flat valve to the inner boundary of the pallial sinus, and a little nearer the centre in the other valve.

Length  $7\frac{1}{2}$  millims., width 9, diam.  $1\frac{2}{3}$ .

Hab. —?

This is a very compressed species, and very finely sculptured. It is thinner than *M. proxima*, with a straighter anterior dorsal margin, more finely sulcated upon both valves, broader and flatter. It is hardly so finely sculptured as *M. tenuisculpta*, and of a different form, being much less elongated transversely.

## EXPLANATION OF PLATE LIII.

Figs. 1, 1a. <i>Myodora oblonga</i> , p. 582.	Figs. 8, 8a, 8b. <i>Myodora proxima</i> , p. 586.
2, 2a. — <i>ovata</i> , p. 582.	9, 9a, 9b, 9c. — <i>boltoni</i> , p. 585.
3, 3a. — <i>trigona</i> , p. 582.	10, 10a. — <i>reeveana</i> , p. 586.
4, 4a. — <i>plana</i> , p. 582.	11, 11a. — <i>tenuisculpta</i> , p. 587.
5, 5a, 5b. — <i>novæ-zealandiæ</i> , p. 584.	12, 12a. — <i>compressa</i> , p. 587.
6, 6a, 6b, 6c. — <i>subrostrata</i> , p. 584.	
7, 7a. — <i>antipodum</i> , p. 585.	

5. On a Collection of Phytophagous Coleoptera made by Mr. Buckley at Eastern Ecuador. By MARTIN JACOBY.

[Received September 7, 1880.]

(Plates LIV.—LV.)

Although the series of Phytophaga collected by Mr. Buckley during his last travels in Ecuador is not very numerous and is devoid of the smaller species of *Halticidæ* and *Galerucidæ*, it nevertheless contains a good many new and interesting species, of which a great part are not only inhabitants of Ecuador, but have also been found either in Peru or the Amazonian region. The insects here described are in the collection of Messrs. Godman and Salvin and my own.

Genus LEMA, Fab.

1. LEMA VIRIDANA, sp. nov.

Oblong, parallel. Flavous; head, antennæ (the two apical joints excepted), tibiæ, and tarsi black; elytra deeply punctate-striate, metallic green, the lateral margin and the apex flavous.

Length  $3\frac{1}{2}$  lines.

Head rather deeply constricted behind the eyes, the vertex with a small fovea; front deeply grooved on either side, the intermediate space and the clypeus impunctate, shining black; antennæ half the length of the body, black, the last two joints and part of the preceding flavous. Thorax a little broader than long, sides rather deeply constricted, the basal transverse groove deep and distinct; surface smooth, flavous, shining; scutellum black. Elytra very slightly constricted laterally before the middle, deeply punctate-striate, the interstices strongly raised towards the apex, anteriorly here and there transversely wrinkled and minutely punctate. Underside, with the exception of the upper part of the breast, which is black, as well as the underside of the femora and tibia, flavous; tarsi black.

From *L. cincta*, Lac., distinguished by the black head, the colour of the antennæ, and the strongly raised elytral costa; from *L. limbatipennis*, Jacoby (Journ. Munich Entom. Soc. 1878), by the black antennæ and the colour of the legs.

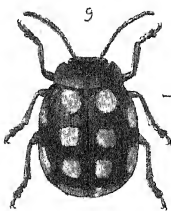
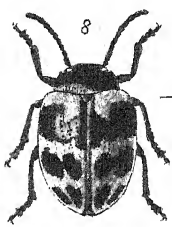
Mus. Jacoby.

2. LEMA SEMICYANEA, sp. nov.

Oblong, convex. Black; abdomen and the base of the thighs flavous; elytra deeply punctate-striate, flavous, a trigonate large patch, from the base to below the middle, metallic greenish blue.

Length 4 lines.

Head impunctate, orbital grooves very deep, the intermediate space raised and bordered behind by a distinct transverse groove, entirely black; antennæ one third the length of the body, black. Thorax transverse, very deeply constricted at the sides and transversely grooved near the base; a rather deep but short longitudinal

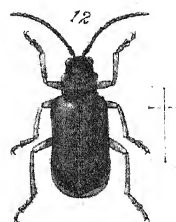
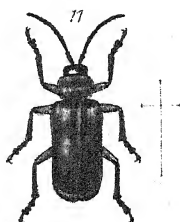
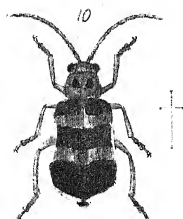
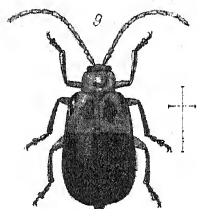
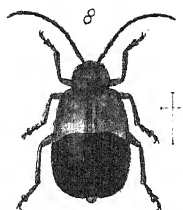
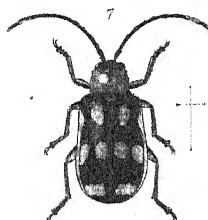
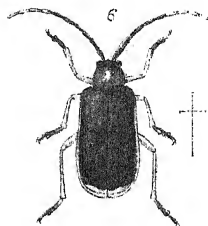
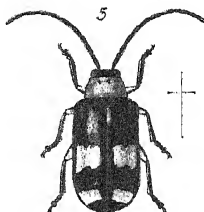
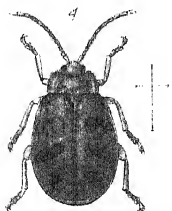
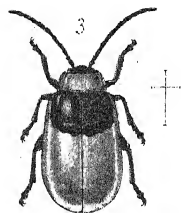


W. Purkiss lith.

Hanhart imp.







W Parkiss. lith.

Hanhart. imp



groove is situated at the middle near the base; anterior angles of the thorax rounded; surface shining black, with two short rows of small punctures; scutellum black. Elytra much wider than the thorax, deeply punctate-striate, more finely punctured near the apex, the interstices at the latter place semicostate, impunctate, flavous; a broad pear-shaped metallic blue patch, common to both elytra, occupies nearly the entire disk, commencing from the scutellum and ending at about two thirds of the length of the elytra, without, however, touching the lateral margins, the posterior margin of this patch is nearly truncate, the hinder angles oblique. Underside and legs black, base of the femora and lower part of the abdomen flavous.

This species bears some resemblance to *L. degaudei*, Baly, also from Ecuador; but in that insect the second and third joints of the antennæ are of equal length, which is not the case in the present species, the third joint being double the length of the second; the interspaces of the elytra are not elevated, and the striæ are regular; the blue colour in *L. degaudei* extends also through the entire length of the elytra. It might perhaps best be placed after *L. bipartita*, Lac.

*Mus. Jacoby.*

### 3. LEMA FLAVICORNIS, sp. nov.

Oblong, fulvous; head, sides of the breast, and a spot on each femur black; antennæ flavous, the basal joint black.

Length  $3\frac{3}{4}$  lines.

Extreme base of the head fulvous, the rest black, shining, impunctate, finely transversely grooved behind the eyes, orbital grooves very deep; antennæ one third the length of the body, rather robust, flavous, the first joint subglobular, black. Thorax subquadrate, anterior angles rounded, basilar transverse groove distinct, sides deeply constricted below the middle; surface fulvous, with two parallel rows of fine punctures from the apex to the middle. Elytra convex, strongly punctate-striate near the base, the punctures becoming very fine towards the apex; interstices smooth, not costate, minutely punctured towards the base. Sides of the breast and a mark in the shape of a ring at the middle of the femora black; rest of the underside and the legs fulvous; claws piceous.

*Mus. Jacoby.*

### Genus MASTOSTETHUS, Lacord.

#### 4. MASTOSTETHUS BUCKLEYI, Baly, Cistula Entomol. 1878.

*Mus. Godman and Salvin.*

#### 5. MASTOSTETHUS THORACICUS, Baly, Ann. Nat. Hist. 1859, p. 200.

#### 6. MASTOSTETHUS MODESTUS, sp. nov.

Broadly ovate, robust. Light fulvous; head black, variegated with testaceous, sides and base of mesothorax black; elytra fulvous, with

a black transverse sinuate fascia at the apex, surrounding a light flavous apical spot.

Length 5 lines.

Head distinctly punctured in front of the eyes, black; lower part of the face deeply excavated, that portion, as well as the anterior margin of the clypeus and labrum, flavous; two testaceous spots are placed near the upper part of the eyes. Antennæ rather long, extending further than the base of the thorax, fulvous, the first four joints black above. Thorax impunctate, of usual shape. Elytra moderately deeply and closely punctured, coloured like the thorax; the apex of each elytron occupied by a black narrow band in the shape of a ring, the upper portion of which is widened towards the lateral margin; the space *within* this ring is of a light testaceous or yellowish colour, as well as a convex narrow band *above* the black marking; the elytra may also be described as light flavous at their last third, interrupted by a black ring near the apex; a short lateral streak of flavous extends also from the shoulders downwards. Underside testaceous; sides of the breast and base of the mesothorax black; legs fulvous, tarsi and claws piceous.

*Mus.* Godman and Salvin.

#### 7. *MASTOSTETHUS SUAVIS*, Bates.

Of this species, two specimens were collected by Mr. Buckley. The elytra have four black spots each, of which the two anterior ones are longitudinal and oblique, the others transverse, but isolated in the specimens from Ecuador, and not connected in shape of a ring, according to Mr. Bates's description of his type.

### Genus *AGATHOMERUS*, Lacord.

#### 8. *AGATHOMERUS SIMPLICIPENNIS*, sp. nov.

Elongate, parallel. Flavous-testaceous; shining, a transverse band at the vertex, labrum, antennæ, part of the anterior femora, and the tibiæ and tarsi black.

Length 5 lines.

Head deeply punctured near the eye, the rest impunctate; flavous, with a broad black band between the eyes. Antennæ extending to the base of the thorax, black, the first four joints shining, the rest pubescent. Thorax transverse, sides nearly straight seen from above; disk with a transverse groove near the anterior and posterior margins, the former slightly arched at each side, the latter nearly straight; surface glabrous, impunctate, fulvous, margined anteriorly and posteriorly with testaceous. Scutellum trigonate, its apex rounded. Elytra closely but rather finely punctured, the punctures much more distant towards the apex, coloured like the thorax. Underside of the same colour, the femora rather darker; hinder tibiæ distinctly curved, covered, like the rest of the underside, with long testaceous hairs.

*Mus.* Godman and Salvin.

## Genus MEGALOPUS, Fabr.

## 9. MEGALOPUS ARMATUS, Lacord.

I am somewhat doubtful whether I am to refer the specimens collected by Mr. Buckley to this species, inasmuch as they differ in coloration from any specimens of *M. armatus* I have seen; but as this difference is the only one, and the insect itself is rather variable in that respect, I consider it a local variety, which differs from the type as follows: there are three transverse fulvous bands at the elytra in both male and female, which is the case also in *M. armatus*, but in the female only; the apex of the elytra in the Ecuador insects is also fulvous, with the exception of a black spot in the centre; in *M. armatus* the apex is always black. There are eight specimens before me from Ecuador which show no variation in colour; and it is therefore not improbable that they belong to another species according to our present ideas.

## 10. ISCHIOPACHYS BICOLOR, Lacord.

## 11. ISCHIOPACHYS FULGIDIPENNIS, Lacord.

## 12. POROPLEURA CÆLESTINA, Lacord.

## 13. CHALCOPLACIS RUFIVENTRIS, Erichs.

The antennæ in the only specimen before me are entirely rufous, thus differing from the type; the elytra are dark violaceous.

## Genus METAXYONYCHA, Marsh.

## 14. METAXYONYCHA LEFEVREI.

*Colaspis lefevrei*, Baly.

On account of the distinct concavity at the end of the intermediate tibiæ, I think this species ought to be classed in the genus *Metaxyonycha*. The specimens from Ecuador do not vary from Baly's type before me.

## 15. PRIONODERA ELEGANS, Jacoby.

## Genus COLASPIS, Fabr.

## 16. COLASPIS BUCKLEYI, sp. nov.

Ovate. Dark metallic green below, antennæ and legs dark brown; above dark purplish, the margins of the thorax and that of the elytra narrowly metallic green.

Length  $4\frac{1}{2}$  lines.

Head deeply but not closely punctured, with a central deep groove; anterior margin of the epistome metallic green, labrum black; palpi slender, testaceous; antennæ fulvous, joints 5-8 piceous, the apical ones testaceous. Thorax about twice as broad as long, sides distinctly bidentate; surface punctured like the head, impressed at each side with a rather deep fovea, the ground of all the punctures metallic green, this colour specially noticeable near the margins on

account of the closer punctuation. Scutellum impunctate. Elytra very convex, very dark purplish, subopaque; the punctuation not differing from that of the other parts, but closer and arranged in almost regular rows near the suture, more confused near the sides, where a costa runs parallel with the lateral margin; the apex of the tibiae and the tarsi fulvous, rest of the legs dark brown.

*Mus. Jacoby.*

17. *COLASPIS CHLORITES*, Erichs.

18. *COLASPIS FULVILABRIS*, sp. nov.

Oblong. Below bluish black, shining; legs and antennæ (three middle joints of the latter excepted) testaceous, labrum fulvous; above dark violaceous; sides of thorax one-toothed, deeply punctate.

Length  $4\frac{1}{2}$  lines.

Head with a distinct central groove ending in a shallow fovea, rather closely and deeply punctate; antennæ testaceous, joints 6–8 piceous. Thorax convex, distinctly toothed at the middle of the lateral margin, in front of which the latter is widened; anterior angles thickened, posterior ones acutely toothed; surface distinctly foveolate at each side, deeply and irregularly punctured. Elytra convex, scarcely wider at the base than the thorax, punctured like the latter, but the punctures more evenly distributed; interstices smooth except near the apex, where they are somewhat wrinkled. Underside shining, lead-coloured; legs fulvous.

*Mus. Jacoby.*

19. *COLASPIS NIGRIPENNIS*, sp. nov.

Black, antennæ and legs testaceous; thorax bisinuate at the sides, and, as well as the elytra, finely punctate.

Length 4 lines.

Head with deep oblong punctures between the eyes and a narrow longitudinal central groove; clypeus and the vertex more sparingly punctate; labrum fulvous; antennæ nearly as long as half the body, together with the palpi testaceous. Thorax transverse, convex, obsoletely bisinuate at the lateral margin, surface with a deep fovea at each side; surface distantly and finely punctate, the punctures near the sides deeper but not more closely placed, the interstices at the same place also very minutely punctured when seen under a strong glass. Scutellum finely longitudinally striate. Elytra parallel, moderately convex, punctured like the thorax, but more regularly striate, except near the lateral margin, where the puncturing becomes more confused. Underside black with a bluish tint, legs entirely testaceous.

*Mus. Jacoby.*

20. *COLASPIS FOVEICOLLIS*, sp. nov.

Greenish black below, above black, last four joints of the antennæ and the legs testaceous; thorax bidentate, deeply foveolate at the sides; elytra finely subgeminately punctate-striate.

Length 3 lines.

Head transversely and longitudinally grooved, with a few irregularly distributed deep punctures, violaceous or purplish; labrum fulvous, with a piceous patch. Antennæ more than half the length of the body, the first seven joints black, shining, the others testaceous, closely pubescent. Thorax convex, distinctly bisinuate, all the angles acute, the posterior ones toothed; disk with a very deep oblique fovea near the base at each side; several shallow obsolete depressions are also situated near the base; rest of the surface very remotely and rather finely punctured, black with a slight purplish tint, the lateral margin metallic green; scutellum smooth. Elytra very slightly transversely depressed below the base, each elytron with about seven double rows of punctures finely impressed, the first two rows consisting of only a single line of punctures towards the posterior half, the other rows somewhat irregular; surface of the same colour as the thorax, rather broadly margined with metallic green. Underside darker green; legs testaceous, last two joints of the tarsi fuscous.

*Mus.* Jacoby.

#### Genus CHALCOPHANA, Chev.

##### 21. CHALCOPHANA EFFULGENS, Erichs.

##### 22. CHALCOPHANA BUCKLEYI, sp. nov.

Black; abdomen, base of the femora and tibiæ rufous; head and thorax fulvous; elytra dark purplish, shining, the lateral margin narrowly and the apex broadly testaceous.

Length 4 lines.

Head with a deep central groove and a transverse depression between the eyes, the upper part remotely punctured, lower part of face testaceous; first three joints of the antennæ testaceous, marked with black at the upperside, the rest dark fulvous or piceous. Thorax narrow, transverse, anterior angles acute, testaceous or fulvous; surface with a few very deep punctures on the disk, more crowded at the sides and intermixed with smaller ones; scutellum purplish. Elytra with a shallow transverse depression below the base, moderately deeply and rather regularly punctate-striate, the punctuation much finer towards the posterior part; a highly raised costa runs parallel with the lateral margin to the apex, where it ends in a point; the elytra are of a dark purplish colour, margined with testaceous, the latter colour widened into a triangular patch at the apex. Breast, the first abdominal segments, and the apex of the femora and tibiæ greenish black; all the other parts rufous.

I also possess this species from Peru.

*Mus.* Godman and Salvin.

##### 23. CHALCOPHANA DIMIDIATA, Baly.

##### 24. CHALCOPHANA IGNICOLLIS, sp. nov.

Broadly ovate. Metallic green, last seven joints of the antennæ and the tibiæ and tarsi black; above dark purplish; head, thorax,



and the apex of the elytra metallic rufo-aureous, margined with green.

Length 4 lines.

Upper part of the head rufo-aureous, remotely and deeply punctate, lower part metallic bluish green, more finely punctate, labrum and the four basal joints of the antennæ fulvous, rest of the joints black. Thorax long for this genus, about twice as long as broad, the anterior margin straight, the sides evenly rounded, all angles acute but not produced; surface remotely but deeply punctate, intermixed with minute punctures, coloured like the upper part of the head, margined with metallic green; scutellum pentagonal, smooth, of the latter colour. Elytra not wider at the base than the thorax, deeply punctate near the sides, finer and much more distantly towards the apex, the punctures at the latter placed regularly in double rows, otherwise confusedly arranged; extreme apex brilliant metallic green, bordered with rufo-aureous above, but not extending to one third of the length of the elytra.

This species is also found in the Amazonian region.

*Mus.* Jacoby.

#### Genus EUMOLPUS, Weber.

##### 25. EUMOLPUS PRASINUS, Erichs.

Amongst the normal-coloured specimens an entirely black variety has been collected, which, however, does not differ in other respects.

##### 26. EUMOLPUS SURINAMENSIS, Fabr.

#### Genus COLASPOIDES, Casteln.

##### 27. COLASPOIDES CUPREIPENNIS, sp. nov.

Subrotundate, convex. Rufous; last seven joints of the antennæ black; elytra greenish aureous, shining, finely punctate.

Length 3 lines.

Head impunctate; clypeus separated from the front by a more or less triangular transverse groove; jaws black; antennæ two thirds the length of the body, third joint one third longer than the fourth, four basal joints fulvous, the others black, rather compressed from the seventh joint. Thorax narrow, about three times as broad as long, the anterior margin not produced, sides rounded, fulvous, surface smooth, impunctate. Scutellum subtriangular, impunctate, æneous or purplish. Elytra convex, rounded towards the apex, obsoletely obliquely depressed round the humeral callus; surface finely semipunctate-striate, the punctuation not very closely placed, dark greenish or purplish æneous. Underside and the legs entirely rufous.

Closely allied to *C. bicolor*, Oliv., but distinguished by the colour of the elytra, which is blue in this species; it may, however, be but a local variety of that insect.

*Mus.* Godman and Salvin.

28. *COLASPOIDES ELONGATUS*, sp. nov.

Subelongate. Fulvous; elytra black, very finely punctate-striate. Length  $3\frac{3}{4}$  lines.

Head with a short longitudinal fovea in the middle, impunctate; upper part of the clypeus depressed, when seen in a certain light finely punctate; labrum subquadrate, mandibulæ black; antennæ nearly as long as half the body, entirely fulvous, third joint twice as long as the fourth. Thorax transversely convex, its sides much deflexed, surface impunctate, shining fulvous; scutellum subrotundate, smooth, black. Elytra much longer than broad, parallel, shining black, regularly convex, surface very finely punctate, the punctures arranged in regular rows near the suture, more irregularly towards the sides. Underside and legs entirely fulvous.

*Mus.* Godman and Salvin.

Genus *PLAGIODERA*, Chevrol.29. *PLAGIODERA SEXMACULATA*, sp. nov.

Subrotundate, convex. Fulvous; last six joints of the antennæ and seven small spots on the thorax black; elytra light fulvous, a pear-shaped sutural mark, a small spot near the apex, and two subtriangular large patches on each elytron, one before, the other behind the middle, dark metallic blue.

Length 4 lines.

Head flat, with a few fine punctures; labrum deeply emarginate; antennæ extending further than the base of the thorax, the first five joints fulvous, the rest black, compressed. Thorax narrowly transverse, the anterior margin deeply concave, the posterior one obsoletely bisinuate; surface finely punctate, the disk with seven small black spots, of which five are placed in a semicircular row near the base, and the other two in the centre above it. Scutellum subelongate, smooth, dark fulvous. Elytra slightly widened at the middle, from there to the apex regularly rounded, irregularly but distinctly and much more deeply punctured than the thorax, with the humeral callus prominent, and the lateral margin thickened anteriorly and posteriorly; the disk of each elytron is occupied by two triangular blue patches, of which the anterior one is the smallest; the sutural pear-shaped spot extends from the base to the middle; the rest of the sutural margin is also of a piceous colour, and connected at the apex with another round blue spot. Underside and legs entirely fulvous.

*Mus.* Godman and Salvin.

Genus *PROSICELA*, Chevrol.30. *PROSICELA FLAVIPENNIS*, Erichs.31. *PROSICELA SPECTABILIS*, Baly.32. *PROSICELA SIMPLICIPENNIS*, sp. nov.

Oblong-ovate. Black; thorax bifoveolate, minutely punctate; elytra irregularly but distinctly punctate, flavous.

Length  $4\frac{1}{2}$ –5 lines.

Head with some fine punctures and irregular impressions near the eyes; anterior margin of labrum testaceous; antennæ black, extending one third the length of the body, apical joints long. Thorax about twice as broad as long, scarcely widened in the middle, sides nearly straight, the anterior angles produced and pointed; surface with a few distinct punctures near the base; the disk remotely and finely punctate, with a deep round fovea at each side, and another oblique shallower depression at the lateral margin, as well as the scutellum, black. Elytra oblong, convex, rather closely and deeply punctate, the punctures forming irregular double rows near the suture, but confusedly arranged at the rest of the surface. Under-side and legs black.

### 33. *PROSICELA BICRUCIATA*, sp. nov.

Oblong-ovate. Greenish black, shining; elytra deeply punctate-striate, flavous; the suture, a short transverse oblique band below the base, common to both elytra, and another larger one behind the middle greenish black.

Length 5 lines.

Head with a fine central groove and a few irregularly distributed punctures; labrum piceous, finely margined with testaceous; antennæ extending to half the length of the body, greenish black. Thorax twice as broad as long, its sides nearly straight, and the anterior angles produced into a point; surface very minutely punctured, with a few remotely placed deeper punctures near the base greenish black; scutellum impunctate. Elytra with about ten rows of rather deep punctures, visible to the naked eye, the punctures running in double lines towards the lateral margin; the others consisting of single rows, but meeting at their ends at the apex, where the interstices are raised into costæ; they are of a light flavous colour, with a short transverse greenish-black band across the suture below the base having an upward direction, and another more irregular-shaped band, and hollowed at its anterior margin, extending nearly to the sides, below the middle; the suture also is of the same colour, but gradually narrowed to the apex; claws simple.

### Genus *DORYPHORA*, Illig.

34. *DORYPHORA PUNCTATISSIMA*, Oliv.

35. *DORYPHORA BATESI*, Baly.

36. *DORYPHORA PRINCEPS*, Gray.

37. *DORYPHORA FULGORA*, Stål.

The Ecuador specimens are devoid of the fulvous spots of the head and thorax, and approach nearer to *D. celsa*, Erichs.; the coarser sculpturing of the elytra and the elongate terminal joint of the antennæ, however, distinguish it from that species.

38. *DORYPHORA RUBROPUNCTATA*, De Geer.

39. *DORYPHORA BUCKLEYI*, Baly, Journ. Linn. Soc. vol. xiv. (Zoology) p. 352.

40. *DORYPHORA FABRICII*, De Geer.

41. *DORYPHORA JAVETI*, Baly.

This species seems to be subject to variation, varying from 6 to 8 lines in size. The smaller specimens show a much finer punctuation of the thorax, and approach nearer in that respect *D. alunna*, Stål; but they do not differ in other respects from *D. javeti*, and I consider them to be a variety of that species.

42. *DORYPHORA FULVICORNIS*, Guér.

43. *DORYPHORA THOMSONI*, Baly.

The Ecuador specimens differ from the type in having two metallic green spots at the base of the head, but are similar in all other respects.

44. *DORYPHORA PLUVIATA*, Baly.

45. *DORYPHORA AMBIGUA*, Erichs.

46. *DORYPHORA NYMPHA*, Stål.

I cannot find any difference between this species and *D. pulchella*, Baly (Entom. Monthly Mag. 1877), except that the latter is metallic blue instead of green. Baly does not himself point out the difference; and as some specimens from Ecuador, collected by Mr. Buckley, are also blue, I believe the two insects to be identical.

47. *DORYPHORA FESTIVA*, Baly.

48. *DORYPHORA HEBE*, Baly.

49. *DORYPHORA CHAPUISI*, Baly.

50. *DORYPHORA VESPERTINA*, Baly.

51. *DORYPHORA DEGAUDEI*, Baly.

52. *DORYPHORA FLEXUOSA*, Baly.

53. *DORYPHORA ALBOVIRENS*, Stål.

54. *DORYPHORA FUNEBRIS*, sp. nov.

Oblong-ovate. Metallic green; elytra finely geminate-punctate-striate, testaceous, each elytron with three deeply dentate transverse greenish æneous bands.

Length  $6\frac{1}{2}$ –7 lines.

Head very finely punctate; labrum testaceous; antennæ black, the two basal joints metallic green, fulvous below, apical joints distinctly flattened and as broad as long, terminal joint longer than broad. Thorax rounded and widened near the apex, anterior angles mucronate; surface with a distinct round fovea on each side near the lateral margin, distinctly but very remotely punctate, with a deeply

## Genus DESMOGRAMMA, Erichs.

## 59. DESMOGRAMMA MARGINELLA, sp. nov.

Ovate, convex. Fulvous; elytra punctate-striate, violaceous black, the lateral margin flavous.

Length  $3\frac{1}{2}$  lines.

Head with a distinct central line and a few rather deeply impressed punctures; labrum testaceous. Antennæ black, their five basal joints fulvous, the seventh to the eleventh joints gradually widened and thickened. Thorax transverse, three times as broad as long, sides straight near the base, slightly rounded near the apex; surface distantly impressed with deep punctures, fulvous, the extreme base at each side stained with piceous. Scutellum elongate, smooth, fulvous. Elytra very convex, longer than broad, each elytron with six rows of rather regularly placed punctures on the inner disk; rest of the surface confusedly punctate, nearly black, with a slight violaceous tint, the lateral margin narrowly flavous, this colour slightly widened near the apex. Underside and legs fulvous.

*Mus. Jacoby.*

## Genus ELYTROSPHÆRA, Stål.

## 60. ELYTROSPHÆRA FLAMMIGERA, Stål.

## HALTICINÆ.

## Genus CRIMISSA, Stål.

## 61. CRIMISSA CRURALIS, Stål.

## Genus ASPICELA, Clark.

## 62. ASPICELA ALBOMARGINATA, Latr.

## 63. ASPICELA RUGOSA, Guér.

## 64. ASPICELA DISCOIDALIS, Clark.

## 65. ASPICELA CRETACEA, Latr.

## Genus CÆDIONYCHIS, Latr.

## 66. CÆDIONYCHIS SEPTEMMACULATA, Jacoby.

Also Peru.

## 67. CÆDIONYCHIS BIFASCIATA, Baly.

Also met with on the Amazons.

## Genus RHOICUS, Clark.

## 68. RHOICUS MACULICOLLIS, sp. nov.

Oblong-ovate. Flavous; antennæ (their two apical joints excepted), three spots on the head and five on the thorax, as well as the tibiæ and tarsi, black; elytra subopaque, finely punctate-striate, testaceous, the sutural and lateral margins, and a basal, a central, and an apical spot on each elytron black.

Length 4 lines.

Head much longer than broad, with a few punctures at the base,

flavous, shining, a spot at each side at the base and another between the eyes black. Antennæ robust, reaching to a short distance below the base of the elytra; the third joint the longest, black; the two terminal joints fulvous. Thorax nearly square-shaped, slightly broader than long, the sides distinctly angulate before the middle, the anterior angles broadly produced; surface impunctate, flavous, shining, with five round black spots, of which three are placed transversely near the anterior, the other two near the posterior margin. Scutellum triangular, black, pubescent. Elytra much wider at the base than the thorax, subdepressed; extremely finely granulate and punctate-striate, subopaque, testaceous, each elytron with a round spot at the base, another transverse-shaped one at the middle, and a third, of the same shape but much narrower, near the apex, black; the sutural and lateral margins are of the same colour; some remotely placed black hairs are visible near the apex of the elytra. Underside and legs (with the exception of the tibiæ and tarsi, which are black) flavous, shining.

This handsome species bears some superficial resemblance to *R. trifasciatus*, Jacoby (Cistula Entomologica, 1879, vol. ii. p. 520), but is at once distinguished by the spots of the head and thorax, and the black tibiæ and tarsi, as well as the antennæ.

*Mus.* Jacoby.

#### Genus ASPHÆRA, Chevrol.

##### 69. ASPHÆRA TOMENTOSA, sp. nov.

Oblong-ovate, convex. Black, margin of the thorax rufous; elytra finely granulate and punctate, opaque, sparingly pubescent, obscure rufous variegated with black.

Length  $4\frac{1}{2}$  lines.

Head deeply transversely grooved between the eyes, the base finely granulate, and rather deeply punctate at each side. Antennæ nearly as long as half the body, black, pubescent; the last four joints closely covered with whitish hairs. Thorax with its sides straight and narrowed from base to apex, all the angles acute but not produced; surface finely granulate, covered here and there with yellow hairs, black, opaque, margined with rufous. Elytra convex, slightly widened behind; surface very finely granulate and punctured, covered (especially near the apex) sparingly with golden-yellow hairs; obscure rufous mixed with black, the former colour prevailing near the apex. Underside and legs black, covered sparingly with yellow pubescence; first tarsal joint as long as the two following united, posterior claw moderately swollen.

This interesting species is, as far as I know, the only one belonging to the genus *Asphæra* in which the upper parts are pubescent as well as the underside.

*Mus.* Jacoby.

##### 70. ASPHÆRA BASALIS, sp. nov.

Oblong. Black, abdomen fulvous; thorax and elytra testaceous, the latter with a subrotundate large basal black patch.

PROC. ZOOL. SOC.—1880, No. XL.

40

Length 4 lines.

Head longer than broad, impunctate, the usual frontal elevations almost absent, with a short but deep longitudinal groove. Antennæ half the length of the body, black. Thorax about twice as broad as long, narrowed in the middle, sides moderately flattened and rounded, the posterior margin straight, anterior angles produced into a distinct tooth; surface impunctate, light fulvous or testaceous. Scutellum black. Elytra slightly widened posteriorly, distinctly margined, the base of each elytron distinctly raised and limited behind by a transverse depression; surface very minutely punctate, testaceous, with a purplish black subrotundate patch from the base to nearly the middle, but not extending to the lateral margin. Breast and part of the first abdominal segments, as well as the legs, black; abdomen fulvous; claw-joint moderately thickened.

*Mus. Jacoby.*

71. *ASPHÆRA DECEMMACULATA*, sp. nov.

Broadly ovate. Light fulvous; elytra closely and deeply punctate, testaceous, stained with piceous near the apex, each elytron with the base, a spot at the shoulder, two others before and two narrow transverse bands behind the middle, bluish black.

Length  $4\frac{1}{2}$  lines.

Head broader than long, vertex swollen and impunctate, divided from the frontal tubercles by a transverse groove, the former rather broad and divided by a narrow central groove. Antennæ entirely fulvous, the last four terminal joints shorter than the preceding ones. Thorax three times as broad as long, sides much flattened and separated from the disk by a sinuate groove, the anterior angles much produced and terminating in a distinct tooth; surface with a few fine punctures. Scutellum fulvous, impunctate. Elytra much widened behind the middle with a distinct flattened margin, closely and deeply punctured; each elytron with a spot at the shoulder, two others below the base, transversely placed, a narrow transverse line immediately below the middle, and another oblique one near the apex, as well as basal and sutural margins, bluish black; these posterior bands extend to the lateral, but not to the sutural margin; inflexed margin of the elytra concave, its anterior half fulvous, the posterior one piceous. Underside and legs obscure fulvous, claw-joint rather swollen.

*Mus. Jacoby.*

GALERUCINÆ.

Genus *DIABROTICA*, Chev.

72. *DIABROTICA DIMIDIATA*, Baly.

This is one of the largest known species of the genus *Diabrotica*, varying from five to over six lines. I may add to Baly's short diagnosis, that the head is much longer than broad, the antennæ extending to two thirds the length of the body, with the third joint double the length of the second. Thorax with a curved transverse depression at the disk, not extending to the sides, impunctate. Elytra

much widened posteriorly, very finely punctate, the anterior portion to nearly the middle flavous, the rest, as well as the abdomen, bluish or greenish black.

Also found on the banks of the Napo.

73. *DIABROTICA DISCOIDALIS*, Baly.

The specimens collected by Mr. Buckley agree very nearly with Dr. Baly's description, but show the following differences:—The broad transverse band of the elytra is light green instead of flavous; the entire elytral margin and the apex are also of the former colour, which Baly does not mention; the black parts of the elytra are connected laterally by a narrow line. Not having the type to compare, I am unable to say whether my insects are specifically different.

An almost similarly coloured species is the following:—

74. *DIABROTICA TRANSLUCIDA*, sp. nov.

Light-green; head, breast, and legs black; elytra finely punctate, a transverse band at the base, and another broader one near the apex, black.

Length 3 lines.

Head impunctate, frontal tubercles obsolete; antennæ half the length of the body, the second and third joints short, fourth joint longer than the two preceding united, black, three basal joints testaceous stained with piceous above, ninth and tenth joints flavous. Thorax subquadrate, very obsoletely bifoveolate at the disk; the latter impunctate, light green; scutellum black. Elytra slightly widened behind, finely punctured, of the same colour as the thorax; a narrow transverse basal band deeply tridentate at its posterior margin, and a much wider one, rounded at its margins, close to the apex, black. Legs and breast black, the base of the femora light green.

75. *DIABROTICA VARIOLOSA*, Jacoby, P. Z. S. 1878, p. 151.

76. *DIABROTICA PUNCTICOLLIS*, Baly.

77. *DIABROTICA VERRUCOSA*, sp. nov.

Testaceous; head and six basal joints of the antennæ black; thorax fulvous, trifoveolate; scutellum piceous; elytra rugose, punctate, and transversely wrinkled, metallic green, the lateral margin and the apex testaceous.

Length 4 lines.

Head longer than broad, foveolate between the eyes, impunctate. Antennæ two thirds the length of the body, second joint short, third joint more than twice as long, the rest of nearly equal length, slender; the six basal joints black, underside of the first three and the terminal five joints flavous, extreme apex black. Thorax transverse, the sides distinctly sinuate near the base, deflexed, and longitudinally grooved parallel with the lateral margin, posterior angles tuberculate; surface impunctate, fulvous, with a deep oblique fovea at each side, and an oblique longitudinal central groove near the



base. Elytra rugose and irregularly wrinkled, green, the lateral margin narrowly and the apex broadly testaceous. Legs very long and slender, first joint of the posterior tarsi longer than the following joints together; entire underside and legs pale testaceous.

♂. Elytra near the apex with a short curved ridge.

Nearly allied to *D. eximia*, Baly, but distinguished by the colour of the underside and of the antennæ.

*Mus. Jacoby.*

78. *DIABROTICA FLAVONOTATA*, sp. nov.

Ovate, convex. Flavous; head and breast black; antennæ piceous, the tenth joint testaceous; thorax fulvous; elytra finely semipunctate-striate, violaceous blue, shining, each elytron with five spots (2, 2, 1) and the margin flavous.

Length 4 lines.

Head longer than broad, impunctate, black, with a large shallow fovea between the eyes; lower part of face partly punctate, with some yellow hairs. Antennæ as long as half the body, the second joint about one half the size of the first, the third joint more than twice the length of the second; the three basal joints piceous, testaceous below, the tenth joint entirely of that colour, the rest black. Thorax transverse, the sides nearly straight; surface very obsoletely transversely grooved, very finely punctate; scutellum fulvous. Elytra widened behind, distinctly margined, finely punctured, the punctures arranged in rather regular rows near the suture, violaceous blue; a narrow spot below the shoulder, a larger one near the scutellum, two round spots placed transversely at the middle, and a narrow transverse spot near the apex flavous. Underside and legs testaceous; breast and a streak on the upper part of the femora and on the anterior tibiæ black; the four posterior tibiæ and the tarsi entirely black, clothed, like the breast, with thick yellow pubescence.

Allied to *D. regalis*, Baly, and *D. angulicollis*, Erichs.

*Mus. Jacoby.*

79. *DIABROTICA NIGROPLAGIATA*, sp. nov.

Oblong-ovate, widened behind. Black; head, antennæ, thorax, and the femora fulvous; elytra finely punctured; the anterior half fulvous, with four black spots, posterior half black.

Length  $4\frac{1}{2}$  lines.

Head longer than broad, wedge-shaped, with a deep longitudinal central groove; the frontal tubercles very obsolete, entirely impunctate. Antennæ half the length of the body, the third joint one half longer than the second, fourth and following joints longer than the third; fulvous, the apical joints slightly darker. Thorax subquadrate, narrowed at the base, the sides at the same place flattened, surface rather convex, obsoletely transversely depressed near the base; disk shining, impunctate. Elytra distinctly widened posteriorly and convex, very finely punctured, a little more strongly towards the basal half, with some very obsolete longitudinal costæ towards the apex; the anterior fulvous portion does not quite extend

to the middle, and is very regularly divided by the posterior black part; each elytron has also two black spots at the base—one at the shoulder, the other near the scutellum. Underside (with the exception of that of the thorax) and the tibiæ and tarsi black, closely covered with yellow pubescence; coxæ and the femora fulvous.

To be distinguished from *D. divisa*, Baly, and its allies, by the colour of the underside and the black spots of the elytra.

*Mus.* Godman and Salvin.

#### 80. *DIABROTICA QUADRIMACULATA*, sp. nov.

Elongate. Black; antennæ (the three apical joints excepted), thorax, femora, coxæ, and two transverse bands on each elytron (one below the middle, the other near the apex), as well as two small spots below the base, flavous.

Length  $4\frac{1}{2}$  lines.

Head very finely granulate and punctate, the frontal tubercles distinct and divided by a deep groove; lower part of face either flavous or black, like the rest of the head. Antennæ as long as half the body; the second joint half the length of the third, rest of the joints slender and filiform, pubescent; three apical ones flavous, the extreme apex black. Thorax a little broader than long, with the angles slightly produced; surface rather convex, flavous, minutely punctured and extremely finely granulate, without impressions. Scutellum black. Elytra finely but more distinctly punctured than the thorax, also very finely granulate, black; each elytron with a very small spot below the shoulder, another below the base near the suture, a broad transverse band below the middle, not extending to the sutural margin, and a narrow transverse band near the apex light flavous. Underside, tibiæ, and tarsi black; coxæ, femora (the latter streaked with black above), and the margins of the abdominal segments flavous, all covered with rather long yellow hairs.

From *D. generosa*, Baly, this species may be distinguished by the want of the foveæ at the thorax, the greater size, and the colour and length of the antennæ.

*Mus.* Jacoby.

#### 81. *DIABROTICA BASALIS*, sp. nov.

Oblong-ovate, widened behind. Rufous; antennæ, tibiæ, and tarsi black; thorax transversely depressed; elytra finely punctate, a transverse band at the base rufous, another at the middle flavous, the rest black.

Length 3 lines.

Head longer than broad, front impressed with a distinct fovea. Antennæ two thirds the length of the body, filiform, third joint double as long as the second, black. Thorax broader than long, narrowed at the base; anterior angles produced into a short obtuse tooth; disk with a deep sinuate transverse groove not extending to the sides; surface impunctate, rufous; scutellum of the same colour. Elytra distinctly widened posteriorly, convex, closely but finely punctured; a narrow, transverse, rufous band at the base; another

testaceous band below the latter; and the posterior half of the elytra black. Entire underside and the femora rufous; tibiæ and tarsi black.

82. *DIABROTICA ATRIVENTRIS*, sp. nov.

Oblong-ovate, widened behind. Flavous, shining; antennæ (the first joint excepted), tibiæ and tarsi, abdomen, and the posterior half of the elytra black.

Length 3 lines.

Head much longer than broad, longitudinally grooved in the middle, impunctate. Antennæ two thirds the length of the body, the second joint half the length of the third, black; basal joint fulvous. Thorax transversely subquadrate, widened at the middle, surface impressed with a deep transverse sinuate groove not extending to the sides; disk minutely punctured. Elytra closely and finely but much more distinctly punctured than the thorax; the anterior half fulvous, the rest black; breast and the femora fulvous; abdomen, tibiæ, and tarsi black.

The small size and the differences in colour will distinguish this species from others nearly similarly coloured.

Genus *CEROTOMA*, Chevrol.

83. *CEROTOMA TRIFASCIATA*, sp. nov.

Black; head, legs, and thorax fulvous, the latter deeply sulcate, with two piceous spots; elytra costate, the intervals geminate-punctate, flavous; a transverse band at the base, another at the middle, and a third one near the apex bluish-black.

Length 4 lines.

♀. Head and epistome deeply rugose punctate; labrum testaceous, with a piceous mark; antennæ light testaceous, the basal joint flavous. Thorax with a deep sinuate fovea in the middle of the disk in shape of a W, and having a piceous spot at each end; surface with a few obsolete punctures near the anterior margin; scutellum fulvous. Elytra widened behind, each elytron with seven or eight longitudinal costæ, which do not quite extend to the apex; the interstices deeply geminate-punctate; flavous, with three transverse bluish-black bands, of which the last is the broadest and extends to the lateral margin, the others not quite reaching it; underside black, the abdominal segments margined with fulvous, legs entirely of that colour.

This species is not unlike *C. deyrollei*, Baly, but is much larger, and differs in the colour of the underside and in the two spots of the thorax.

*Mus.* Godman and Salvin.

Genus *CÆLOMERA*, Chevrol

84. *CÆLOMERA BUCKLEYI*, sp. nov.

Elongate, parallel(♂), or dilated posteriorly(♀). Flavous; head, antennæ, breast, tibiæ and tarsi, and last joint of the abdomen

black; elytra finely rugose, punctate, and pubescent, metallic blue or violaceous.

Length 6-7 lines.

Head convex, with a more or less distinct central groove, finely punctate. Third joint of the antennæ very long, and much longer than the two preceding ones, rest of the joints closely covered with whitish pubescence. Thorax but moderately constricted near the base, rather obsoletely transversely grooved on the disk; impunctate, shining flavous. Scutellum subquadrate, black, distinctly punctate. Elytra convex and parallel in the male, or slightly constricted at the middle, finely rugose, punctate, and covered with thin whitish hairs, dark blue or violaceous.

The black abdominal last segment and the tibiæ, as well as the black scutellum and the fine pubescence of the elytra, distinguish this species from *C. violaceipennis*, Clark. Except in the colour of the elytra, all the specimens before me resemble each other perfectly.

85. *CÆLOMERA RUFICOLLIS*, Oliv.

86. *CÆLOMERA CAJENNENSIS*, Fabr.

#### Genus MALACOSOMA, Chevrol.

87. *MALACOSOMA OLIVACEUM*, Fabr.

88. *MALACOSOMA OBSOLETUM*, Fabr.

#### Genus DIRCEMA, Clark.

89. *DIRCEMA RUFIPENNIS*, sp. nov.

Fulvous below; head and antennæ black, last five joints of the latter flavous; thorax transversely sulcate, rufous, shining; elytra finely punctate and pubescent, rufous.

Length 5 lines.

Head swollen, longitudinally impressed between the antennæ, finely punctured at the same place, black; lower part of the epistome and margin of the labrum more or less testaceous; palpi flavous; antennæ black, extreme base of the first and the last five joints flavous. Thorax narrowly transverse, the sides greatly widened and rounded near the apex; disk broadly transversely sulcate, very remotely but distinctly punctate, with a few yellowish hairs; rufous, very shining. Scutellum pubescent, rufous. Elytra parallel, convex, of a lighter rufous than the thorax, and less shining, closely punctured, and finely covered with yellow hairs. Entire underside and the legs pale fulvous.

Easily distinguished from any other species of this genus by the rufous colour and glossy appearance of its upper surface.

#### Genus MONOCESTA, Clark.

90. *MONOCESTA DIMIDIATA*, Jacoby, P. Z. S. 1877, p. 520.

Also found in Peru.

91. *MONOCESTA SPLENDIDA*, Clark.

Six specimens of this handsome species were collected; they differ slightly from the type in the metallic blue (not green) colour of the elytra and underside, as well as in the somewhat stronger punctuation of the former parts.

Genus *CHTHONEIS*, Baly.92. *CHTHONEIS APICALIS*, sp. nov.

Elongate, widened posteriorly. Black; elytra finely and closely punctured, fulvous, their posterior half dark blue.

Length 5 lines.

Head distinctly punctured at the vertex, the latter obscure rufous, deeply transversely grooved between the eyes; antennæ half the length of the body, black; first and fourth joints of nearly equal length and the longest, second and third joints subequal, the rest subdepressed, widened. Thorax subquadrate, broader than long, the angles thickened; surface irregularly depressed, closely and rather strongly punctured; scutellum black, triangular. Elytra widened from base to apex, moderately convex, very closely and rather finely punctured, the interstices slightly wrinkled, the anterior portion to a little below the middle fulvous, the rest dark greenish blue, shining. Abdomen at the sides or entirely testaceous, rest of the underside and the legs black.

*Mus.* Godman and Salvin, and Jacoby.

I believe I am right in referring the above insect to Mr. Baly's *Chthoneis*, although the species before me is larger and more robust and the antennæ shorter; the open anterior coxal cavities, the compressed antennæ, however, as well as the unarmed tibiæ and the long first tarsal joints, agree well with the typical species belonging to Baly's genus.

*Index of Species.*

- |   |   |
|---|---|
| <i>Lema viridana</i> , sp. nov., p. 588.      | <i>Chalcophana effulgens</i> , p. 593.      |
| — <i>semicyanea</i> , sp. nov., p. 588.       | — <i>buckleyi</i> , sp. nov., p. 593.       |
| — <i>flavicornis</i> , sp. nov., p. 589.      | — <i>dimidiata</i> , p. 593.                |
| <i>Mastotethus buckleyi</i> , p. 589.         | — <i>ignicollis</i> , sp. nov., p. 593.     |
| — <i>thoracicus</i> , p. 589.                 | <i>Eumolpus prasinus</i> , p. 594.          |
| — <i>suavis</i> , p. 590.                     | — <i>surinamensis</i> , p. 594.             |
| — <i>modestus</i> , sp. nov., p. 589.         | <i>Colaspoides cupreipennis</i> , sp. nov., |
| <i>Agathomerus simplicipennis</i> , sp. nov., | p. 594.                                     |
| p. 590.                                       | — <i>elongatus</i> , sp. nov., p. 595.      |
| <i>Megalopus armatus</i> , p. 591.            | <i>Plagioderma 6-maculata</i> , sp. nov.,   |
| <i>Ischiopachys bicolor</i> , p. 591.         | 595.  |
| — <i>fulgidipennis</i> , p. 591.              | <i>Proscicela flavipennis</i> , p. 595.     |
| <i>Poroplectura celestina</i> , p. 591.       | — <i>spectabilis</i> , p. 595.              |
| <i>Chalcoplaeis rufiventris</i> , p. 591.     | — <i>simplicipennis</i> , sp. nov., p. 595. |
| <i>Metaxyonycha lefevrei</i> , p. 591.        | — <i>bieruciana</i> , sp. nov., p. 596.     |
| <i>Prionoderma elegans</i> , p. 591.          | <i>Doryphora punctatissima</i> , p. 596.    |
| <i>Colaspis buckleyi</i> , sp. nov., p. 591.  | — <i>batesi</i> , p. 596.                   |
| — <i>chlorites</i> , p. 592.                  | — <i>princeps</i> , p. 596.                 |
| — <i>nigripennis</i> , sp. nov., p. 592.      | — <i>fulgora</i> , p. 596.                  |
| — <i>fulvilabris</i> , sp. nov., p. 592.      | — <i>rubropunctata</i> , p. 596.            |
| — <i>foveicollis</i> , sp. nov., p. 592.      | — <i>buckleyi</i> , p. 597.                 |

*Doryphora fabricii*, p. 597.  
 — *javeti*, p. 597.  
 — *fulvicornis*, p. 597.  
 — *thomsoni*, p. 597.  
 — *pluviata*, p. 597.  
 — *ambigua*, p. 597.  
 — *nympha*, p. 597.  
 — *festiva*, p. 597.  
 — *hebe*, p. 597.  
 — *chapuisi*, p. 597.  
 — *vespertina*, p. 597.  
 — *degaudei*, p. 597.  
 — *flexuosa*, p. 597.  
 — *albovirens*, p. 597.  
 — *funeris*, sp. nov., p. 597.  
 — *6-guttata*, sp. nov., p. 598.  
 — *marginicollis*, sp. nov., p. 598.  
 — *connexa*, sp. nov., p. 599.  
 — *selecta*, p. 599.  
*Desmogramma marginella*, sp. nov., p. 600.  
*Elythrosphæra flammigera*, p. 600.  
*Crimissa cruralis*, p. 600.  
*Aspicela albomarginata*, p. 600.  
 — *rugosa*, p. 600.  
 — *discoidalis*, p. 600.  
 — *cretacea*, p. 600.

*Ædionychis 7-maculata*, p. 600.  
 — *bifasciata*, p. 600.  
*Rhoicus maculicollis*, sp. nov., p. 600.  
*Asphæra tomentosa*, sp. nov., p. 601.  
 — *basalis*, p. 601.  
 — *10-maculata*, sp. nov., p. 602.  
*Diabrotica dimidiata*, p. 602.  
 — *discoidalis*, p. 603.  
 — *translucida*, sp. nov., p. 603.  
 — *variolosa*, p. 603.  
 — *puncticollis*, p. 603.  
 — *verrucosa*, sp. nov., p. 603.  
 — *flavonotata*, sp. nov., p. 604.  
 — *nigroplagiata*, sp. nov., p. 604.  
 — *4-maculata*, sp. nov., p. 605.  
 — *basalis*, sp. nov., p. 605.  
 — *atriventris*, sp. nov., p. 606.  
*Cerotoma trifasciata*, sp. nov., p. 606.  
*Cœlomera buckleyi*, sp. nov., p. 606.  
 — *ruficollis*, p. 607.  
 — *cajennensis*, p. 607.  
*Malacosoma olivaceum*, p. 607.  
 — *obsoletum*, p. 607.  
*Dircema rufipennis*, sp. nov., p. 607.  
*Monocesta dimidiata*, p. 607.  
 — *splendida*, p. 608.  
*Clithoneis apicalis*, sp. nov., p. 608.

## EXPLANATION OF THE PLATES.

## PLATE LIV.

- Fig. 1. *Lema semioyanea*, p. 588.  
 2. *Mustostethus modestus*, p. 589.  
 3. *Colaspis foveicollis*, p. 592.  
 4. — *nigripennis*, p. 592.  
 5. — *buckleyi*, p. 591.  
 6. *Proscicela bicruciatæ*, p. 596.  
 7. — *simplicipennis*, p. 595.  
 8. *Doryphora connexa*, p. 599.  
 9. — *6-guttata*, p. 598.  
 10. — *marginicollis*, p. 598.  
 11. — *funeris*, p. 597.  
 12. *Plagiodera 6-maculata*, p. 595.

## PLATE LV.

- Fig. 1. *Rhoicus maculicollis*, p. 600.  
 2. *Asphæra tomentosa*, p. 601.  
 3. — *basalis*, p. 601.  
 4. — *10-maculata*, p. 602.  
 5. *Diabrotica 4-maculata*, p. 605.  
 6. — *verrucosa*, p. 603.  
 7. — *flavonotata*, p. 604.  
 8. — *basalis*, p. 605.  
 9. — *nigroplagiata*, p. 604.  
 10. *Cerotoma trifasciata*, p. 606.  
 11. *Cœlomera buckleyi*, p. 606.  
 12. *Dircema rufipennis*, p. 607.

6. Descriptions of some supposed New Species of Butterflies from New Guinea. By F. D. GODMAN and O. SALVIN.

[Received September 16, 1880.]

## (Plate LVI.)

Mr. Andrew Goldie, who visited New Guinea in 1879, sent us in February last a small collection of Butterflies, made by himself about thirty miles in the interior from Port Moresby. The specimens were, unfortunately, pinned and packed in boxes; and several

of them getting loose in transit caused much damage to the others, so that the greater part arrived in a very broken condition. A portion of the same collection, which Mr. Goldie considered duplicates of those he had forwarded to us, was sent to the Rev. Mr. Lawes, of Reading. Mr. Lawes subsequently disposed of them to Mr. Henley G. Smith, by whom they were submitted to us for examination. Amongst these were some species not included in the first set we received. Since this Mr. Goldie has sent us from the same collection a third set; and it is from these several sources that the following descriptions have been compiled. Besides those here described, the collection contains others which are probably still unnamed; but we prefer to await the arrival of further specimens before we determine the species.

*MELANITIS AMABILIS*, Boisd. Voy, Astr. Lép. p. 140, t. 2. f. 1, 2.

♂. Much smaller than female; upperside dark brown, wings crossed beyond the end of the cell by a broad yellow band extending to the anal angle.

*Mus. nostr.*

Boisduval describes and figures the female of this species from an individual from New Ireland, from which locality we have also received it. Mr. Goldie now sends it from Port Moresby, together with three specimens of the male, which we believe has been hitherto unknown; and we therefore give a short description of it.

*MYCALESIS MELANOPIS*, sp. nov. (Plate LVI. fig. 1.)

♂. Exp. 2·3 inches.

Black, proximal half (except the costa) of the primaries bright fulvous, darker towards the base; two white-pupillated black ocelli towards the outer margin—one subapical, the other between the first and second median branches; the basal portion of the secondaries paler brown, a white-pupillated ocellus near the centre of the outer margin. Beneath, basal half of both wings drab, outer half darkish brown, paler towards the margin, and with two fine submarginal darker lines; primaries with two large ocelli, secondaries with four, whereof the second and fourth are the smallest.

*Mus. nostr.*

Allied to *M. mucia*, Hew., from Dorey, but with the fulvous colour of the upperside restricted to the basal half of the primaries; the rest of the wings being nearly black with a brownish tinge; beneath, the ocelli, though similarly placed, are smaller.

*LAMPROLENIS*, gen. nov.

Palpi erect, densely covered with short stiff scales directed outwards, terminal joint short, erect. Primaries pointed, outer margin curved inwards, apex slightly falcate; bases of the costal, median, and submedian nervures swollen; cell moderately long, two long subcostal branches emitted before the end, third branch short; lower discocellular bent to an acute angle, emitting a short recurrent

nervule at the angle; middle discocellular straight, in a line with the upper segment of the lower discocellular; upper discocellular short, directed forwards. Secondaries with the anal angle much produced, and terminating almost in a lobe, outer margin slightly sinuous, abdominal margin with a deep sinus near the anal angle; cell closed with strong nervules; discocellulars long and well defined; third segment of the median nervure long and distinct, the second branch and the lower discocellular each having a distinct origin.

We have been unable to satisfy ourselves as to the correct position of the remarkable species here described; but on the whole it seems to come nearest in relationship to *Mycalesis*, though it differs in several important particulars. The palpi are much the same as in that genus, which it also resembles in having the bases of the costal, median, and submedian nervures swollen, and in the general structure of the primary wings. In shape, however, there is a marked difference, especially in the elongation of the secondaries, and in the neururation of these wings: *Mycalesis* has the lower discocellular starting from the same point of the median as the second median branch, instead of having a distinct origin. In the coloration of both the upper and under surface of the wings *Lamprolenis* differs widely from any *Mycalesis*, though *M. orseis*, in the purple gloss of its upper surface, shows some approach to the style of colour so remarkable in this new form.

*LAMPROLENIS NITIDA*, sp. nov. (Plate LVI. fig. 2.)

Exp. 2·4 in.

Above brown, shot with metallic greenish red, which varies to ornished copper in different lights, and is more intense on the secondaries. Beneath, primaries dullish brown, with irregular darker spots on the proximal half, and a submarginal dark line, a white-pupillated black ocellus surrounded by a light-brown ring about midway between the end of the cell and the apex; secondaries very dark brown, faintly marked with a lighter colour, and with two large pupillated ocelli, situated one about the middle of the costal region, the other near the anal angle.

*Mus. nostr.*

Two specimens of this brilliant species are in Mr. Goldie's collection.

*TENARIS CHIONIDES*, sp. nov.

Exp. 5 in.

Upper surface white, costa of both wings dusky black, primaries tinged with a dusky colour towards the base, secondaries with proximal third ochreous; beneath as above, but with a large ocellus surrounded by an ochreous ring towards the apex of secondaries; head and thorax blackish, body and palpi ochreous.

*Mus. nostr.*

This species resembles *T. jamesi* (Butl. P. Z. S. 1876, p. 767, t. 77. f. 4), but differs in being considerably larger, in having no dusky mark



at the anal angle of the primaries beneath, and in having only one ocellus on the secondaries, which is not visible on the upperside.

*TERINOS ALURGIS*, sp. nov.

Exp. 3·3 in.

Wings vivid purple, with large black patch passing through the middle of the cell and curving round till it meets the centre of the outer margin of the anterior, and extending downwards to the posterior wing, of which it occupies the apical third, primaries with a subapical fulvous mark, secondaries with the anal half of the outer margin tinged with the same colour, and crossed with a double band of purple spots; beneath reddish brown, crossed by undulating silvery grey bands, secondaries with a band of faintish brown spots crossing the wing beyond the cell.

*Mus. nostr.*

Allied to *T. terpander*, Hew., but with the dark patch of the primaries black instead of brown, and the purple of a bluer tint. The primaries are not nearly so falcate, nor does the centre of the outer margin of the secondaries project so much; the blue lunate markings of these wings comes much nearer the outer margin.

*DOLESCHALLIA DASCON*, sp. nov. (Plate LVI. fig. 3.)

♂. Exp. 3·4 in.

Brownish red; apical half of primaries blackish, crossed beyond the cell by a broadish blue transverse stripe partially broken into spots, extending from the costa towards the outer margin; near the costa are two small subapical white dots; costa and outer margin of secondaries dark brown. Beneath rusty brown, with a transverse narrow dark band crossing the middle of both wings; a bent whitish band about the centre of the cell, beyond which is a dark subtriangular spot enclosed by a narrow reddish line; a conspicuous white spot on the costa near the apex, and six very small subparallel to the margin; two ocelli on the secondaries (one near the anal angle, the other towards the apex), and a greyish spot towards the end of the cell.

*Mus. nostr.*

Two males but no female of this species are in the collection.

*DOLESCHALLIA DASCYLUS*, sp. nov. (Plate LVI. fig. 4.)

♂. Exp. 3·5 in.

Black, basal third of primaries bright ferruginous; four subapical white spots, below which are two or three blue ones, the top one much the largest, the third almost, sometimes quite, obsolete; the basal half of the secondaries dark reddish brown; beneath like the preceding species, but much darker.

♀. Like the male, with a broad white band crossing the end of the cell of the primaries, at the upper and inner edge of which is a small black spot; the blue submarginal spots are less conspicuous; beneath paler than the male, a broad whitish grey band commencing at the

costa and extending within the transverse band to nearly the apical angle of secondaries and gradually becoming narrower.

*Mus. nostr.*

This species is much like the last, but differs in having the outer half of both wings black, curtailing to a much greater extent the reddish-fulvous of the basal portion of the wings. The blue spots on the primaries, instead of forming a distinct band across the wing, form the lower end of the apical series of white spots which in *D. duscon* are only indicated near the costal margin.

The female is not unlike that of *D. comriei*, but is smaller, has a more restricted white patch on the primaries, and the base of the wings is of a richer fulvous tint.

*PIERIS ORNYTION*, sp. nov. (Plate LVI. fig. 5.)

♂. Exp. 2.5 in.

Upper surface white, apex of primaries, extending nearly to the anal angle, and cilia of secondaries, black: beneath, apical third of primaries black, tipped with yellow, the rest white; secondaries black, with a strong crimson dash extending from the base some distance along the costal region, and a fine submarginal line of the same colour (in some specimens almost obsolete) commencing shortly beyond this and running to the anal angle.

♀ like ♂, but costa and apical half of primaries black, secondaries greyish, with broad black outer margin; beneath, the black is broader than in the male, and the submarginal red line of the secondaries is but faintly indicated.

*Mus. nostr.*

*PAPILIO GOLDIEI*, sp. nov. (Plate LVI. fig. 6.)

♀. Exp. 3.5 in.

Wings dusky black, primaries beneath the median nervure (and also above, occupying nearly half the cell) creamy-white, divided into four long stripes by the median branches, which are edged with black; a row of submarginal whitish spots commencing near the end of the cell extends to the anal angle; within this are four subapical irregular-shaped spots of the same colour; secondaries have a broad creamy patch, extending from the basal half of the inner margin to beyond the cell, divided by the nervules, which are strongly marked, and a submarginal row of six white spots; beneath as above, but with four small white spots (one on the primaries, three on the secondaries) at the base of the wings.

*Mus. nostr.*

Mr. Goldie has sent four examples of this insect, all of which are females: three of these are precisely similar, and correspond to the description given above; in the fourth (fig. 6) the black extends over the greater portion of the wings, the whitish markings being reduced to a very narrow compass. In the absence of more specimens, we are inclined to regard this as merely a dark variety. In form the species resembles *Papilio leucothoe* of Westwood, from

Malacca; but in the arrangement of its markings there is but little similarity. At present we do not know the male<sup>1</sup>.

*PAPILIO LESCHES*, sp. nov.

Size and shape of *P. albinus*, but with an irregular creamy-white patch, deeply dentate on its outer edge, midway between the end of the cell and the apex of the primaries, extending from the costa to beyond the middle discocellular nervule; beneath, this mark is narrowly indicated, and extending beyond and below it is a broadish band of greyish scales; the secondaries have the white band much narrower than in *P. albinus*.

*Mus. nostr.*

Several examples, all agreeing with one another.

EXPLANATION OF PLATE LVI.

- Fig. 1. *Mycalesis melanopsis*, p. 610.  
 2. *Lamprotenis nitida*, p. 611.  
 3. *Dolenschallia dascon*, p. 612.  
 4. — *dascylus*, p. 612.  
 5. *Pieris ornytion*, p. 613.  
 6. *Papilio goldiei*, p. 613.

November 30th, 1880.

Prof. Flower, LL.D., F.R.S., President, in the Chair.

The following papers were read:—

1. On a collection of Land- and Freshwater Shells from the Transvaal and Orange Free State in South Africa, with Descriptions of nine new Species. By ALFRED E. CRAVEN, F.Z.S., F.L.S., F.R.G.S., &c.

[Received October 8, 1880.]

(Plate LVII.)

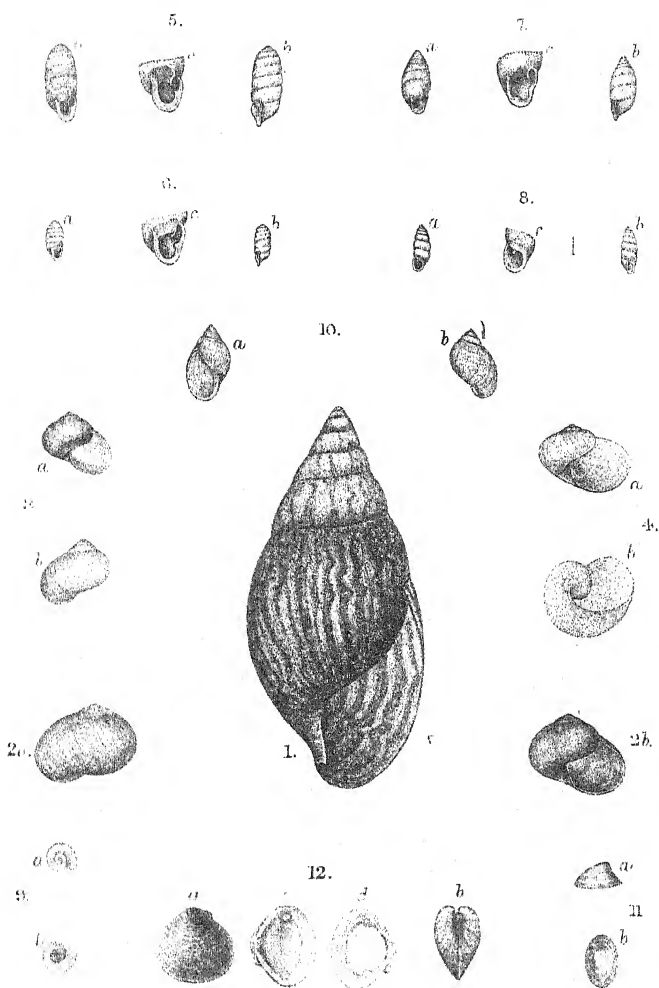
*HELIX (PELLA) PLANTI*, Pfr. P. Z. S. 1854, p. 51; Reeve, Conch. Icon. pl. 189. sp. 1325.

Plentiful at the Leydenburg goldfields.

*HELIX SYMMETRICA*, sp. nov. (Plate LVII. fig. 2.)

Shell globose, imperforate, vitreous, semitransparent, light olive-green, dull above, glossy below and very glossy within the aperture, faintly spirally striated, lines of growth very apparent; spire slightly

<sup>1</sup> Since the above was in type, we have received several more specimens of this species, including males. These do not differ in colour from the females described above. The variation described is shown by these fresh specimens to be due to individual peculiarity.



R. Minter lith.

Minter Bros. imp.



elevated, apex obtuse; whorls  $4\frac{1}{2}$ , symmetrically increasing, convex, the last equal to the others in breadth; aperture large, lunate, as broad as high; labrum simple, acute, slightly reflexed near the upper part of the columella; suture deepish, well defined. Greatest diameter 16 millims., smallest diameter 14, height from base of aperture to apex 11.5, diameter of aperture 9.

*Locality.* Leydenburg, Transvaal. Only a single fine specimen taken.

This species may eventually prove to be a *Vitrina* when the animal has been observed.

VITRINA POEPPIGI, Menke, Pfr. Symb. iii. p. 81.

Not very plentiful on the banks of the Moori River, Transvaal.

VITRINA TRANSVAALENSIS, sp. nov. (Plate LVII. fig. 3.)

Shell globular, hyaline, semitransparent, fragile, glossy, amber-coloured; apex obtuse; whorls  $3\frac{1}{2}$  to 4, very convex, rapidly increasing, the upper whorls smooth, the last faintly striated by the lines of growth and slightly puckered at the suture; suture linear, deep; aperture lunate, as broad as high, slightly flattened at the base. Greatest diameter 10.5 millims., smallest diameter 9, height from base of aperture to apex  $8\frac{1}{2}$ , diameter of aperture  $5\frac{1}{2}$ .

*Locality.* Leydenburg, Transvaal. Not rare.

This species is nearly allied to *V. poeppigi*, Menke, but is more globular and the coloured spiral band found in that species is wanting.

VITRINA VANDENBROECKII, sp. nov. (Plate LVII. fig. 4.)

Shell oblong, vitreous, depressed, flattened above, of a pale yellow colour, dull above, glossy below and within the aperture; apex, suture and margin of labrum of a dark umber-colour; spire depressed, apex very obtuse; whorls  $3\frac{1}{2}$ , the last very large and rapidly increasing, puckered at the suture; suture deep and very well marked; aperture oblong lunate, subhorizontal, flattened beneath; peritreme, viewed from above, rather prominent; columella slightly arcuate. Greatest diameter  $14\frac{1}{2}$  millims., smallest diameter 11, height of aperture  $7\frac{1}{2}$ , breadth of aperture 9.

*Locality.* Plentiful at Leydenburg, Transvaal.

I have great pleasure in naming this shell after my friend M. Ernest Van den Broeck, of the Musée Royale, Brussels.

BULIMUS (PACHNODUS) DRACKENBERGENSIS, E. A. Smith, Ann. & Mag. Nat. Hist. 4th series, vol. xx. p. 538.

*Locality.* Pilgrim's Rest, Transvaal.

BULIMUS (STENOGYRA) TURRIFORMIS, Krauss, Südafr. Moll. p. 78, pl. v. fig. 2; Pfr. in Zeitschr. f. Malak. 1848, p. 121.

Plentiful at Leydenburg, Transvaal.

*BULIMUS (STENOGYRA) LINEARIS*, Krauss, Südafr. Moll. p. 78, pl. v. fig. 3; Reeve, Conch. Icon. pl. 87. sp. 648; Chemn. (2nd edition) Bull. No. 366, pl. 69. figs. 15-17.

Near Wynberg, Orange Free State and Leydenburg, Transvaal; very plentiful.

*ENNEA CRASSILABRIS*, sp. nov. (Plate LVII. fig. 5.)

Shell subcylindrical, perforate, opaque, yellowish white, finely and closely obliquely costulated throughout; spire ovate, apex very obtuse; whorls 8, very slightly convex, the last three of nearly the same diameter, very gradually increasing, the last whorl slightly ascending near the aperture; suture somewhat irregular and presenting a puckered appearance caused by the meeting of the costulae; aperture sinuately semioval, glossy within; paries armed with a large curved lamella extending far within the aperture and forming a deep canal with the outer lip, the lamella somewhat overhanging the canal; a thick tooth is situated about the centre of the outer lip near the margin, and an expansion or plication is placed behind the columella far within the aperture; labrum thickened, expanded and reflexed; a pit or depression behind the labrum corresponds with the tooth within. Length  $11\frac{1}{2}$  millims., diameter of the three equal whorls  $5\frac{1}{4}$ , diameter of aperture  $3\frac{1}{2}$ .

*Locality.* Leydenburg, Transvaal.

*ENNEA INFANS*, sp. nov. (Plate LVII. fig. 6.)

Shell cylindrical, perforate, semitransparent, yellowish brown, glossy, obliquely lirate (lirae attenuating inferiorly), and faintly spirally striate between the lirae; apex obtuse; whorls  $7\frac{1}{2}$ , a little convex, very gradually increasing, the last narrower than the two preceding and ascending slightly near the aperture; suture well marked, denticulated by the extremities of the lirae; aperture small, sinuately semioval; paries furnished with a large straight lamella adjoining and forming a canal with the outer lip; labrum armed with a tooth situated a little below its centre; a pit or depression behind the labrum corresponding with the tooth; peristome thickened, expanded and reflexed, of a pure white. Length 5 to  $5\frac{3}{4}$  millims., diameter  $2\frac{3}{4}$ , diameter of aperture  $1\frac{1}{2}$ .

*Locality.* Leydenburg, Transvaal.

This species at first sight appears to be a perfect miniature of *E. crassilabris*; but, besides its diminutive form, it is more cylindrical than that species, and the dentition of the aperture presents various differences.

*ACHATINA DIMIDIATA*, E. A. Smith, Quart. Journ. Conch. 1878, No. 15, p. 348.

Not rare at Leydenburg, Transvaal.

*ACHATINA TRANSVAALENSIS*, E. A. Smith, Quart. Journ. Conch. 1878, No. 15, p. 351.

Not rare at Leydenburg, Transvaal.

*ACHATINA SMITHII*, sp. nov. (Plate LVII. fig. 1.)

Shell ovately conical, thin, semitransparent, striated by the lines of growth, which, upon the upper whorls and upper part of the last whorl are crossed by coarse spiral striae, producing a granulose striated appearance; whorls 8, somewhat convex, the last occupying about half the entire shell; upper whorls of a dull orange-yellow, last whorl of a greenish yellow, the whole marked with numerous irregularly waved stripes of a burnt-sienna colour; spire somewhat elongated, apex obtuse; suture deep; aperture elliptically ovate, interior having a faint purple lustre and showing the stripes through the shell; columella arcuate, terminating in a small truncation; peristome simple. Length 55 millims., greatest breadth 27, height of aperture  $29\frac{1}{2}$ , breadth of aperture 15.

*Locality.* Leydenburg, Transvaal.

I propose to name this shell after Mr. E. A. Smith, of the British Museum.

*CYCLOSTOMA KRAUSSIANUM*, Pfr. P. Z. S. 1852, p. 64; Chemn. 2nd ed. p. 334, pl. 43. figs. 17, 18.

Very plentiful at Pilgrim's Rest, Transvaal.

*SUCCINEA DELALANDI*, Pfr. Zeitschr. f. Malak. 1851, p. 28; Chemn. 2nd ed. p. 37, pl. 3. figs. 38-40.

In great numbers on the banks of the Oliphant's River, Transvaal.

*LIMNÆA NATALENSIS*, Krauss, Südaf. Moll. p. 85, pl. v. fig. 15; Reeve, Conch. Icon. pl. vii. sp. 46.

Not very plentiful at Pilgrim's Rest, Transvaal.

*PHYSA LIRATA*, sp. nov. (Plate LVII. fig. 10.)

Shell globosely conical, perforate, very thin, shining, vitreous and semitransparent, regularly lirate, very pale horn-colour; spire somewhat produced, apex not very acute; whorls 4, the last very convex and globular; aperture inversely auriform; columella but little curved, exhibiting no fold, considerably reflexed over the umbilicus, which is small but deep. Length 9.9 millims., greatest breadth 7.2, height of aperture 7, breadth of aperture 4.

*Locality.* Mooi River, Transvaal. Plentiful.

This species is remarkable for the regularity of the liræ.

*ANCYLUS TRANSVAALENSIS*, sp. nov. (Plate LVII. fig. 11.)

Shell broadly ovate, horny brown, varying from light to dark, very finely and regularly concentrically striated and also faintly radiately striated; apex somewhat rounded, rather nearer the posterior extremity, a little dextrally recurved; extremities well rounded. In young specimens the radiating striae are very conspicuous. Length 7.5 millims., breadth 5.3, height 3.2.

*Locality.* Mooi River, Transvaal. Plentiful.

This species differs from *A. caffer*, Krauss, in its larger size, the



position of the apex, and the sculpture. In *A. caffer* the radiate striae are much more developed, and the apex is recurved so as to overhang the margin, and is about one quarter of the length of the shell from the extremity, whereas in *A. transvaalensis* it is only a little recurved to one side and is much nearer the centre.

*CORBICULA OLIPHANTENSIS*, sp. nov. (Plate LVII. fig. 12.)

Shell subcircularly trigonal, solid, subequilateral, marked with rather fine concentric striae; epidermis of a greenish yellow colour; interior of shell nearly white, in young specimens of a beautiful pinkish orange towards the umbones; umbones rather prominent; lateral teeth lamellar, finely serrated, produced; hinge-teeth three on each valve, equidistant. Breadth 12 millims., length  $10\frac{1}{2}$ , thickness  $7\frac{1}{2}$ .

*Locality.* Oliphant's River, Transvaal; very plentiful.

This shell resembles *C. africana*, Krauss, in the dentition of the valves, but differs from that species in its smaller size, finer striae, much paler-coloured epidermis, and different-coloured interior.

*UNIO CAFFER*, Krauss, Südafr. Moll. p. 18, pl. 1. fig. 14; Reeve, Conch. Icon. pl. 41. sp. 226.

A very marked variety of this species occurred to me in the Riet Spruit, near Wynberg, in the Orange Free State, differing from the type in its larger size, much more acuminate posterior, rather rounded basal margin, and thicker hinge-teeth. Breadth  $78\frac{1}{2}$  millims., length 39, thickness 25.

2. Description of three new Species of Land-Shells from Cape Colony and Natal. By ALFRED E. CRAVEN, F.Z.S., F.L.S., F.R.G.S., &c.

[Received October 8, 1880.]

(Plate LVII.)

*PUPA (VERTIGO) SINISTRORSA*, sp. nov. (Plate LVII. fig. 8.)

Shell sinistral, subperforate, ovately conical, of a horny-brown colour, paler near the apex, rather glossy, faintly striated by the lines of growth; whorls  $5\frac{1}{2}$ , very convex, gradually increasing, the last two equal in diameter; suture deep and well defined; aperture nearly circular, armed with four internal teeth, viz. one large tooth situated on the paries near its centre, another smaller tooth on the columella far within the aperture, another at the base of the outer lip, and a very small one at its centre; labrum outwardly reflexed; extremities of peristome connected by a thin callosity. Length 3 to  $3\frac{3}{4}$  millims., greatest diameter 2, diameter of aperture 1.

*Locality.* Cape Récif, entrance of Algoa Bay; Klein Setjes Bosch, near Beaufort, Cape Colony. Not very abundant.

In an apparently somewhat younger specimen the same faint brownish tint appears on the under tail-coverts. In the same specimen the pale rufescent margins of the wing-coverts and lesser remiges are more distinct. Feet very slender.

7. On the External Characters and Anatomy of the Red Uakari Monkey (*Brachyurus rubicundus*); with Remarks on the other Species of that Genus. By W. A. FORBES, B.A., F.L.S., Fellow of St. John's College, Cambridge, Prosecutor to the Society.

[Received November 30, 1880.]

(Plates LXI.-LXIII.)

On May 24th, 1879, the Society purchased a female specimen of a red-haired short-tailed American Monkey, which on its arrival was somewhat doubtfully entered as an example of *Brachyurus rubicundus* of Isidore Geoffroy<sup>1</sup>. This animal lived in fair health till April 22nd last, when it died without any premonitory symptoms. On dissection, both lungs and liver, so frequently the seat of disease in Monkeys kept in captivity, were found to be perfectly healthy: indeed, with the exception of a little inflammation of the stomach and small intestines, and a slight intussusception of the transverse colon, no morbid appearances whatever were found.

The death of this animal has enabled me to give that further notice of it promised on its arrival (*vide* Mr. Sclater's monthly report, *infra cit.*), as well as to give some notes on its anatomy. For though, as might have been expected, *Brachyurus* differs in no essential respect from its allies, the great rarity of Monkeys of this genus in captivity makes it advisable to record any facts concerning the anatomy of its soft parts. In particular, the brain of this genus of Monkeys being hitherto unknown, the description of it will fill up one of the few gaps till now left in our knowledge of this organ amongst the Primates.

Our specimen of *Brachyurus* was a female, not yet adult, though perhaps nearly full-grown. All the teeth are in place, but the canines, both above and below, have not yet finished cutting, and the epiphyses of the bones are still unanchylosed.

As regards the name of our animal, I may at once state that, Mr. Blandford having been kind enough to take the skin to Paris for comparison with the types of *Brachyurus rubicundus* in the gallery of the Jardin des Plantes, no doubt remains that it really belongs to that species. The specimen from which Isidore Geoffroy's figure<sup>2</sup> was taken is still extant in Paris; and the apparent shortness of its tail, reproduced in the figure, is due in all probability to the "make" of the skin, the skin of the tail having apparently shrunk

<sup>1</sup> P. Z. S. 1879, p. 551.

<sup>2</sup> Arch. d. Mus. v. pl. 30.

much after the removal of the bones inside. Other specimens in the Paris Museum, Mr. Blanford informs me, have tails of about the same length as ours, while they closely correspond in other respects, the amount of grey on the crown of the head varying in different specimens.

The accompanying plate (Plate LXI.), taken from a sketch made by Mr. Wolf shortly after the animal's arrival, will give a more correct impression of this Monkey than the figures hitherto published of it.

The weight of our specimen, considerably emaciated, was 2 lb. 11 oz. The following measurements were taken on the body before being skinned or otherwise interfered with:—

	inches.
Total length (measured in a straight line from superciliary ridges, over head and body, to tip of tail)..	21·0
Length of tail, including hairs .....	6·5
Fleshy part of tail .....	5·65
Length of head, from occipital prominence to glabellum	2·65
From occiput to anterior margin of upper lip, in a straight line.....	3·65
Breadth of face (just above the eyes, from outer margin of orbits).....	2·0
Breadth of nasal septum .....	0·75
Breadth of mouth .....	1·2
Length of arm .....	5·5
Length of forearm.....	5·0
Length (extreme) of manus .....	3·5
Length of thigh .....	6·5
Length of leg.....	5·75
Length (extreme) of pes (plantar surface) .....	5·25

The face, chin, and sides of the head, as far as the ears, are nearly naked, with only a scanty covering of hairs. The nose and the interval between the eyes (measuring  $\frac{1}{2}$  inch) are very nearly bare, there being here only a very few most minute hairs, only seen in a side light. Along the superciliary ridges are a few long, forwardly directed, black hairs, white at the base, and slightly curved forwards. There are a few similar hairs also on each side of the face between the nostrils and the angle of the mouth, as well as on the chin.

The muzzle, which is somewhat truncated, and the chin are sparsely covered with short bristly white hairs, directed more or less downwards and forwards.

The naked skin of the sides of the head was in life flesh-colour, the naked ears being slightly redder. The face and muzzle were, as will be seen from Mr. Wolf's sketch (Plate LXI.), during life bright vermilion-red, so red, indeed, as to give the animal the appearance of being painted; but the amount of this bright red varied much from time to time, depending, apparently, both on the animal's health and on its emotions. Mr. Bartlett tells me he has seen the

animal flush up, as it were, in a moment a brilliant red all over the naked parts of its face, and as soon become pale again when the disturbing cause had subsided. After death the brilliant red colour was confined to the region of the nasal openings and the interval between them and the upper lip<sup>1</sup>. The eyelashes are represented only by very fine silky minute hairs. The irides were light hazel-brown, the sclerotic white. These points may be well seen in the accompanying figure of the head (Plate LXII.), of the natural size, drawn soon after death by Mr. Smit<sup>2</sup>. The ears are of a somewhat squared shape—much more so than in a specimen of *Pithecia satanas* I was able soon afterwards to examine in the flesh—with the angles rounded off. There is no lobule; and both tragus and anti-tragus are little developed. The helix has a small recurved flap above, lying over the top of the helical fossa. They are quite naked. At a point about corresponding with the top of the occiput there is a parting of the hairs of the head, these radiating forwards, outwards, and backwards from this point—the long red hair which covers the sides of the head, passes over and behind the ears, passing outwards and then forwards, whilst the hairs of the back of the head and neck pass backwards. The short silky grey and white hairs covering the top of the head pass directly forwards. These are very fine, and closely appressed to the scalp; white for the greater part of their length, they become black at the tips; towards the sides and front of the scalp they become tinged with reddish, so gradually passing into the red of the sides of the head. This reddish tinge is produced by the presence on these hairs of a rufous zone between the white of their bases and the black of the tips; a few, however, are black throughout. These short hairs almost entirely disappear a little behind the long superciliary hairs. The hairy covering of the scalp ceases along a line between the top of the ears and the top of the orbits. Below this limit the sides of the head are only very sparsely covered with rather long, fine, forwardly-directed hairs, which are mostly rufous, paler at the base, and black-tipped; here, as elsewhere, however, some are quite black. The skin round the angles of the mouth is, for a small area, almost completely naked. The posterior border of the lower jaw, on the contrary, as well as the sides of the throat, are covered by long rich chestnut largely black-tipped hairs, which are directed forwards; these run as far as the symphysis, and form a sort of whiskers. The hairs of the back of the head, nape, and neck are paler in colour than those on the rest of the body, being pale fulvous, many having, however, black tips, whilst a few are entirely of that colour. The rest of the body is covered with very long, fine, backwardly-directed hairs of a bright rich chestnut colour, as usual more or less black-tipped, with a sprinkling of quite black ones.

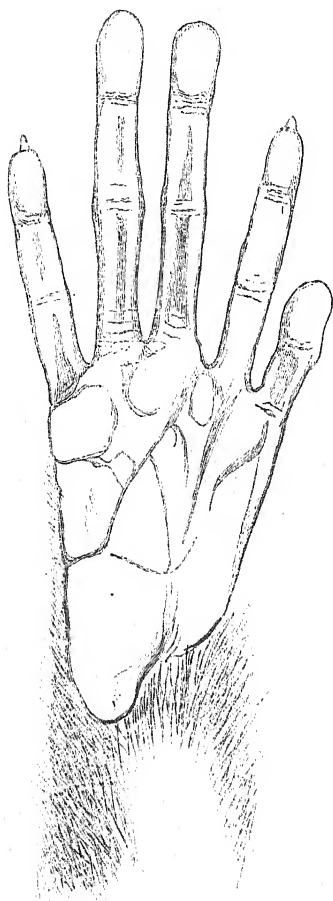
In general colour and texture the coat of the Uakari greatly

<sup>1</sup> Cf. Bates, 'Naturalist on the Amazons,' ii. p. 310.

<sup>2</sup> In this figure the extent of the red colour of the face has been restored, partly from memory and notes taken from the living animal, and partly from the sketch made by Mr. Wolf.

resembles that of the Orang, as was noticed by many who saw the animal alive. These red hairs are continued onto the limbs and tail, the hair being particularly long on the arms, about the shoulders (forming here a sort of cape over the back and shoulders), and along the posterior border of the thigh and leg—there being a

Fig. 1.



Hand of Red Uakari. Palmar aspect ; natural size.

wide patagial-like expansion of skin behind the knee, between the thigh and lower part of the limb. Some of the hairs on the back

Fig. 2.



Foot of Red Uakari. Plantar aspect; natural size.

measure over 4 inches; and those on the limbs are from 3–3½ inches in length<sup>1</sup>. The tail is pretty uniformly covered with moderately long hairs, and is in no degree, in the fresh state, bushy. It is not flattened or bare beneath.

On the forearms the hairs converge on the posterior margin to the elbow, being directed backwards and more or less upwards as the elbow is approached. On the anterior margin, however, all the hairs are directed downwards and forwards, so that a parting of the hairs runs down here from the elbow to the wrist. On the posterior limbs this is not observable. The lower surface of the body is much less hairy than above; and there is a well defined median parting running along it from the thorax to the abdomen.

The greatest length of the hand (fig. 1) is 3·5 inches, the breadth across the knuckles about 1·35. The fourth digit is the longest (2·15), being 0·15 inch longer than the third; the second and fifth are about equal (1·75). The thumb is, as in other *Cebidæ*, directed in the same plane as the remaining digits; it measures 1·15 inch in length, reaching slightly beyond the first phalanx of the second digit. The interdigital membrane is slight. The nails are compressed, and rather elongated, particularly on the fifth digit; that of the pollex is shorter, and more compressed and “nail”-like. The palmar surface is nude; the dorsal sparingly hairy, the hairs extending onto the fingers.

The greatest length of the nude plantar surface is 5·25 inches; its breadth, at the base of the hallux, is 1·5 inch. The toes have about the same relations as the fingers, except that the fifth is notably longer than the second. The fourth is about 2·25 inches long. The hallux measures 1·25 inch, and has a broad oval nail, slightly compressed; the nails of the other digits are much compressed, slightly curved, and rather claw-like. The inferior aspects of the hand and feet, of the natural size, are represented in the accompanying figures (fig. 1, p. 630, & fig. 2, p. 631)<sup>2</sup>.

The axillary folds are well marked; and the axillæ are quite nude, as is a space continuous with them on the inner aspect of the arm for nearly one third its length. The teats, two in number, are situated about 1½ inch from the middle line, just on a line between the ends of the axillary folds<sup>3</sup>, about 1·25 inch from the apex of the axilla.

The umbilicus is represented by a slight, scarcely perceptible slit-like mark 4½ inches from the pubic symphysis. The anus is a transverse slit; the vulva, which is provided with a short clitoris, is

<sup>1</sup> One of the characters of Dr. Gray's genus “*Ouakaria*” is “Fur short, silky”! (Cat. Monk. p. 61).

<sup>2</sup> In fig. 2 the second digit of the foot is seen to be twice bent abruptly on itself. This position was constant after death, and if altered it was always returned to. I am not, however, prepared to say that it is natural, as I never observed it in the living animal. The other digits showed no trace of it.

<sup>3</sup> In a female of *Myocetes seniculus*, examined some years ago by Prof. Garrod and myself, the mammae were found to be situated in the axillæ.

vertical. The perinæum measures about  $\cdot 35$  of an inch. The ischiatic prominences, perinæum, and root of the tail are covered by greyish skin forming a rhomboidal space, about 1.5 inch broad and high; under the tail there is a slight hollow, with a raised fold of skin at each side.

The skin of the cheeks is thin and smooth throughout inside. The hard palate has about ten slightly curved (lunate) ridges on each side, best marked anteriorly, and not meeting mesially. The first two lie between the canines, the last on the level of the last molar. The more posterior ones are faint and irregular, and straighter; the two most anterior the strongest and most curved. In front of the most anterior are two small slits, one on each side of the centre, directed antero-posteriorly, and lying in a line with the inner margin of the median incisor.

The tongue is elongate and parallel-sided, being bluntly squared off at the tip. In front of the palato-glossal folds, which are well developed, it is covered, above and on the sides, with filiform papillæ; below it is smooth. The fungiform papillæ are numerous, and distributed over the sides and tip of the tongue in front of the circumvallate papillæ; of these there are four, arranged in the usual reversed A-shape, the extra one lying on the right side. In *Pithecia satanas* I found three only. There is a "Mayer's organ" of about 15 slits, in the usual position in front of the palato-glossal folds. There is a *frænum linguae*, and a smooth, fleshy, well-developed *sublingua*, bifid apically, with the duct of the submaxillary glands opening on the two papillæ behind this. The uvula is blunt and feebly developed. All the salivary glands are well developed. The parotid is large, measuring 2 inches across at its greatest development; it occupies part of the "anterior triangle," sending a lobe up and behind the auditory meatus; it then runs forward over the masseter muscle, the superior border coinciding with the zygoma, as far as its anterior border, where on one side there is a small downwardly directed lobule developed. Below it extends far into the fossa behind the jaw, and is in contact beneath with the submaxillary. The duct opens opposite the last premolar.

The submaxillary glands are also large; in contact with the parotids above, they nearly meet each other below. A few small accessory lobules appear superficially towards the anterior part. The glands are covered to a large extent by the jaw, running up on the deep side of the ascending ramus of the mandible, and covering there the digastric muscle; at the angle of the jaw they appear superficially. The sublingual glands, well developed, extend back in the floor of the mouth for 1 inch behind the *sublingua*.

On opening the abdomen, the great length and narrowness of the abdominal cavity are striking. The cæcum occupies superficially nearly all the posterior part of the abdominal cavity, filling up thus nearly one third of the whole. Behind, it rests on the bladder, covering the rectum; its apex, directed downwards, lies in the right iliac region. The descending colon is quite superficial and lengthy, as is the ascending, which is also superficial, except in the middle; the trans-



verse, on the contrary, is very short<sup>1</sup>. (It was partly intussuscepted.) The stomach was visible in the left hypochondriac region, the liver appearing all across the abdomen. The great omentum did not cover any of the viscera as now exposed; it was attached only to the upper part of the ascending colon, for about 2 inches. It contained no fat, the animal being, it is to be remembered, considerably emaciated.

The stomach is of the usual Simian form, with a globular cardiac cul-de-sac, and fairly distinct tubular pyloric part; it measured 3 inches in length by  $1\frac{1}{2}$  deep. The pyloric constriction is distinct; and towards that part the walls become thicker. Internally there is a distinct thick ridge on the lesser curvature,  $\frac{3}{4}$  inch to the right of the œsophagus, dividing off the pyloric part, which is quite smooth internally, whilst the mucous membrane of the cardiac part has a few irregular, slightly developed rugæ.

The length of the intestines is as follows:—

Small intestine .....	103·5	inches.
Large „ .....	19·0	
Cæcum (distended).....	6·0	

I append a few measurements of the alimentary canal of other species of Cebine Monkeys for comparison.

Name.	Sex.	Length of				Authority.
		Trunk.	Small intestine.	Large intestine.	Cæcum.	
<i>Ateles geoffroyi</i> (nearly adult) .....	♂	in.	in.	in.	in.	Prof. Flower <sup>2</sup> .
— (young) .....	♂	...	95	17	3·5	A. H. Garrod (MS.).
<i>Cebus capucinus</i> .....	♂	15	99	15	4	W. A. F.
— (young) .....	♂	13	92·5	13	2·75	Prof. Flower <sup>2</sup> .
<i>Lagothrix humboldti</i> .....	♂	13	58	11	2	W. A. F.
<i>Nyctipithecus vociferans</i> ..	♂	...	56·5	8·5	1·75	A. H. Garrod (MS.).
— (young) .....	♂	18	102	19	4	W. A. F.
<i>Callithrix amicta</i> .....	♂	13	37	12	2	W. A. F.
<i>Pithecia monachus</i> (nearly adult).....	♂	...	29·5	12	1·5	A. H. Garrod (MS.).
— (young) .....	♂	...	48	12	2	W. A. F.
<i>Pithecia satanas</i> (young) ...	♂	...	42	11·5	2·5	Prof. Flower <sup>2</sup> .
— (not adult) ...	♂	11	50	22	4·5	W. A. F.
<i>Brachyurus rubicundus</i> (not adult) .....	♀	12·5	52·5	12·75	2	W. A. F.
— (young) .....	♀	...	68	9	2·75	W. A. F.
— (not adult) ...	♀	16	108	12·5	2·75	W. A. F.
<i>Brachyurus rubicundus</i> (not adult) .....	♀	15·5	103·5	19	6	W. A. F.

<sup>1</sup> In *Pithecia satanas* the transverse colon hardly exists, the descending colon being bent sharply back upon the ascending. The cæcum lay altogether to the right of the descending colon and rectum; the latter, therefore, was not hidden by it.

<sup>2</sup> Taken from his lectures, Med. Times &c. May 4, 1872.

As far as can be judged from the few examples given in this table, *Brachyurus rubicundus* apparently has a greater absolute, and even greater relative, length of intestines and cæcum than any other New-world Monkey, including even the considerably larger *Lagothrix*. This would seem to indicate that in its native forests *Brachyurus* is more of a vegetarian than its allies.

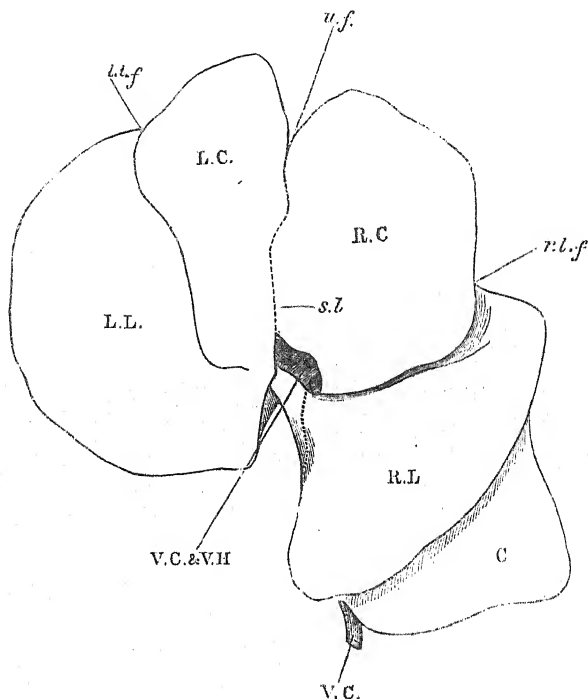
There are no valvulæ conniventes. Peyer's patches are almost confined to the last yard of the ileum, there being 14 large and well defined ones in that space, the largest  $\frac{3}{4}$  inch long. There is a large one close to the ileo-cæcal aperture. Higher up only a few can be found; and they disappear in the jejunum. The cæcum is in no degree sacculated, neither is the colon. The former, which is of considerably larger calibre, is cylindrical, blunt, and curved on itself when distended into more than a circle, with a well-developed median peritoneal frænum.

The general form and proportions of the liver may be seen in figs. 3 & 4 (pp. 636, 637), representing respectively the diaphragmatic and visceral (superior and inferior) aspects of that organ. Regarding its form in the Cebidæ we are told by Prof. Flower, in his lectures on the digestive system of the Mammalia (Med. Times and Gaz., May 4, 1872, p. 509), that "all the members of this group in which he has been able to describe the liver, agree in the depth to which the lateral fissures cut up the organ into its four principal lobes, and also in the great development of the caudate lobe, which is the principal character by which they can at once be distinguished from the Old-world families." In both these respects, as will be seen by an inspection of the figures, the liver of *Brachyurus* is perfectly Cebine. The two lateral fissures extend very nearly, at least on the superior surface, back to the posterior (attached) margin of the liver. The four principal lobes are very distinct; the left central is markedly smaller, as is often the case in the Cebidæ, than the three others, which are here all very nearly equal. The left lateral lobe is decidedly thin along its outer margin; the other lobes are thick, and of simple form; the right lateral is much longer antero-posteriorly than transversely. The caudate is large and square; on its visceral surface it is marked by a conspicuous diagonal ridge running from the entrance of the *vena cava* towards its postero-external angle. It develops two well-marked though small fissures, but is otherwise simple. The right lateral lobe appears internally to it, when viewed from below. The Spigelian is an elongated, somewhat clavate thickening, which is not free, but is most developed on the left side. The umbilical fissure is well-marked, extending for about one third of the total median depth of the liver. There is no trace of a cystic notch; and the gall-bladder, which is large, does not reach by some little distance the anterior (free) margin of the liver. It lies very superficially, and, as in most of the Cebidæ (though not in *Cebus* itself or in *Ateles*), lies very close to, and almost in, the umbilical fissure. An accessory lobule, developed at the internal angle of the left central lobe, helps in large part, on this side, to form a shallow cystic fossa. A second similar, but smaller, partly free lobule is also developed

by the left lateral lobe at its antero-internal angle. The *vena cava inferior* is almost entirely bridged over by hepatic tissue between the Spigelian and caudate lobes. The development or otherwise of this bridge, however, is an unimportant feature in the liver of the Primates, and is largely an individual structure.

On the whole, this liver of *Brachyurus rubicundus* more resembles that of *Callithrix amicta* in its structure and proportions than that

Fig. 3.



Liver of Red Uakari, from above. About natural size.

of any other species I am acquainted with, though I have not seen that of *Pithecia monachus*<sup>1</sup>, which, judging from Prof. Flower's description<sup>2</sup>, must much resemble that of *Brachyurus*. In two specimens I have by me of the liver of *P. satanas*, the caudate lobe is triangular and forked instead of square, and the left lateral lobe is proportionally smaller than in *Brachyurus*; this develops moreover

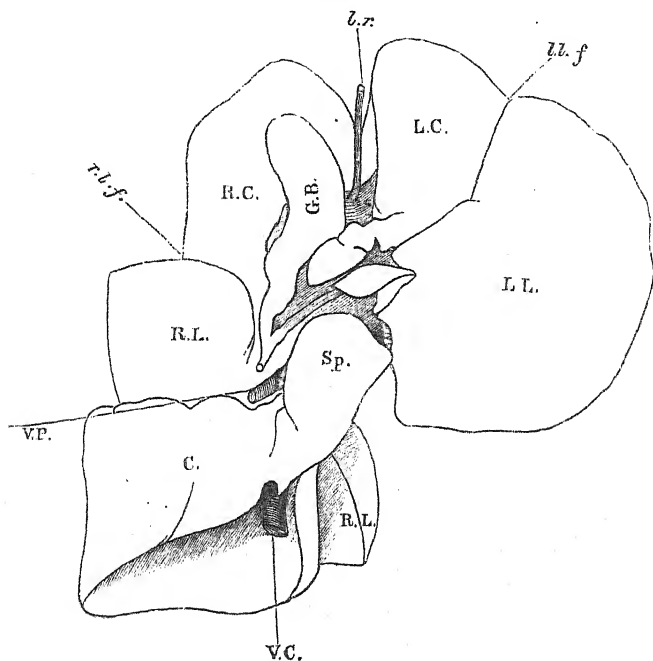
<sup>1</sup> P.S. Jan. 27, 1881.—The recent death of a specimen of this species allows me to confirm the resemblance of its liver to that of *Brachyurus*.

<sup>2</sup> P. Z. S. 1862, p. 332, and Med. Times, &c., s. c. p. 508.

a very marked, subtriangular, inwardly directed process at its antero-internal angle, which is not seen in the other genus.

The pancreas is fairly compact, and is, at its greatest extent, 3 inches long; its duct opens, with that of the bile-duct,  $\frac{1}{2}$  inch from the pylorus. About  $\frac{1}{2}$  an inch from the common aperture of these in the duodenum is a smaller opening, apparently that of a secondary pancreatic duct.

Fig. 4.



The same, from below.

R.C. Right central lobe. L.C. Left central lobe. R.L. Right lateral lobe. L.L. Left lateral lobe. C. Caudate lobe. Sp. Spigelian lobe. u.f. Umbilical fissure. r.l.f. Right and left lateral fissures. G.B. Gall bladder. V.P. Vena porta. V.H. Hepatic vein. V.C. Vena cava inferior. s.l. Suspensory ligament. l.r. Ligamentum rotundum.

The spleen is elongated and flattened, and attached to the left of the greater curvature of the stomach; it is of a red colour, and  $2\frac{1}{8}$  inches long.

The great vessels are given off as in Man and the other Primates. The external and internal iliacs are given off from a common trunk; the caudal artery is small.

The lungs have two lobes on the left, and three on the right side<sup>1</sup>,

<sup>1</sup> In a ♀ *Pithecia satanas* the right lobe was only two-lobed, the extra superior lobe being only indicated and not cut off.

besides an azygos lobe, which lies behind the heart in a transverse direction, and is triangular in shape. The left lower lobe is the largest, the right lower the next.

The cricoid cartilage is deeply notched above. The vocal cords are well developed, .35 of an inch long; the ventricles have the shape of watch-pockets, extending downwards and inwards. There are no laryngeal pouches. The epiglottis is notched above. There are about 27 tracheal rings.

The kidneys are smooth and rather elongated in shape; the suprarenal bodies are well developed and oval. The ureters open .75 inch from the neck of the bladder.

The ovaries measure .45 inch, the Fallopian tubes 1 inch. The uterus is single and smooth within; it is .75 inch long. The vagina is double that length; and the clitoris is small and flattened.

As regards the osteology, already briefly described by Gervais ("Remarques ostéologiques sur les genres *Brachyure* et *Uallitriche*") in Castelnau's "Expédition dans l'Amérique du Sud" [Paris, 1855, Anatomie, pp. 93-99], there is not much of interest to add.

The vertebral formula of my specimen of *Brachyurus* is C. 7, D. 13, L. 6, S. 4, C. 15 or 16<sup>1</sup>.

Gervais gives C. 7, D. 14, L. 6, S. 4, C. 17 for *B. rubicundus*; the British Museum Catalogue 7, 13, 6, 3, 18, for both *B. calvus* and *B. melanocephalus*. In the latter skeleton ("*Ouakaria spixii*," 806  $\bar{\sigma}$ ) I counted, however, nineteen or twenty caudal vertebrae, the first five of which bear transverse processes, whilst the terminal ones are very minute and styliform.

The carpus has an *os centrale*, and the humerus a well-marked supracondylar foramen. The clavicles are well-developed, and strongly curved sigmoidally. The manubrium sterni is broad.

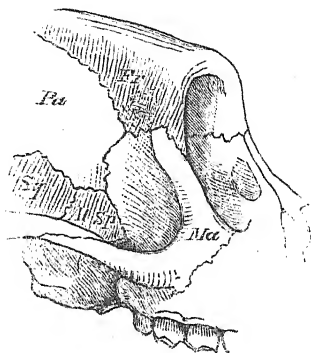
I may, however, take this opportunity of pointing out a useful means of discriminating, in most cases, between the skulls of the Platyrrhine and Catarrhine Monkeys, in addition to the well-known differences in their dentition and in the form of their external auditory meatus.

In nearly every skull of a New-world Monkey, it will be found that the *parietal* and *malar* bones are in contact with each other, for a more or less considerable extent, on the side walls of the skull (*vide* fig. 5). In the Old-world Monkeys, on the contrary, this contact *never* (with the exception named below) takes place, the frontal and alisphenoid bones articulating with each other, and so cutting off the connexion between the parietals and malars (*vide* fig. 6). In the skulls of the genus *Hyllobates* that I have examined this isthmus is very narrow, so that the parietals and malars approach much nearer each other than is usually the case in the Catarrhini; indeed, in one specimen in the College of Surgeons Museum (5027 B) the malar and parietal of *one side* only touch each

<sup>1</sup> In my specimen the few minute terminal caudal vertebrae have unfortunately been laid aside, and cannot now be found. There were not, however, more than three or four of them, which, added to the twelve that remain, give the above numbers.

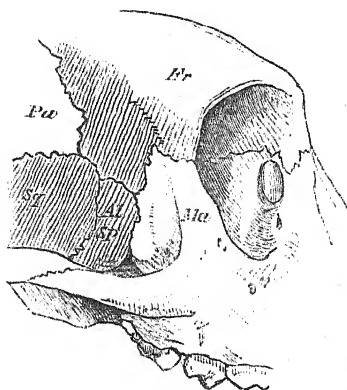
other for a very short distance, the frontal and alisphenoid *not* meeting. On the other hand, in all the New-world Monkeys' skulls that I have examined, the arrangement above described obtains, except in some skulls of the genera *Mycetes* and *Ateles*. Thus of five

Fig. 5.



Part of side walls of skull of a New-world Monkey (*Brachyurus rubicundus*). The parietal (*Pa*) and malar (*Ma*) articulate, as in other members of this group.

Fig. 6.



The same parts in an Old-world Monkey (*Cercopithecus pyrrhonotus*), showing the parietal and malar separated from each other by the intervention of the frontal (*Fr*), alisphenoid (*Al*), and squamosal (*Sq*), which are shaded obliquely.

skulls of the first genus in the Royal-College-of-Surgeons Museum, in one the sutures are invisible on account of age, whilst in the remaining four the union takes place in one only on both sides,

and not at all in the remaining three. In the same collection, a single skull of an *Ateles* (4717a) also shows no trace of this union.

In all the remaining genera, so far as I have yet seen, the rule holds good. I was first struck with the arrangement here described when examining the collection of Monkeys' skulls in the Cambridge Museum; and finding that there was no exception whatever, either there or in the skulls belonging to the Prosecutor's department, I examined the entire collection of unmounted skulls in the College-of-Surgeons Museum (including nearly every known genus of Monkey), with the results already mentioned. The character is at all events worth knowing for practical purposes, even if of no greater scientific value. This, of course, must be left open for more extensive examination<sup>1</sup>.

The brain of *Brachyurus rubicundus* is represented in the accompanying figures (figs. 7-10, pp. 642, 643), which give views of its superior, inferior, external, and internal aspects, of the natural size, drawn after the organ had been hardened in spirit for a short time.

The total length of the hemispheres is 2·3 inches, their greatest breadth 1·8 inch, whilst the vertical depth is about 1·25 inch. Viewed from above, the hemispheres have a fairly rounded contour, and the cerebellum does not project beyond their posterior margin, though it appears above in the middle line between the somewhat cut-away inner margins of the occipital lobe. From the side, the hemispheres are seen to be but slightly arched. The occipital lobe is well developed, and the orbital surfaces but little excavated. The temporal lobes are also well developed.

The hemispheres possess the most important sulci characterizing the Simian brain well developed; as regards their complexity, they stand between *Ateles*, *Cebus*, and *Lagothrix*, on the one side, and *Callithrix*, *Mysetes*, *Pithecia*, &c., on the other.

The Sylvian fissure<sup>2</sup> (s.) is well developed, running upwards and backwards to end, '3 inch from the middle line of the hemispheres, a little in advance of the spot where the temporo-occipital sulcus

<sup>1</sup> P.S. Jan. 27, 1881.—My views have been both confirmed and anticipated by Dr. Gustav Joseph, in a paper in the first volume of the 'Morphologisches Jahrbuch' (i. pp. 453-65, Taf. xv.). Whilst my paper was going through the press, Prof. Flower was kind enough to call my attention to this paper, as well as to another by the same author in the 'Bericht der Schlesischen Gesellschaft'—which, as yet, I have not been able to see—both being referred to in a recently published ethnological paper (in Russian) by Demetrius Arnoutchine, which also, apparently, contains some more information on the same subject.

<sup>2</sup> In the following description of the sulci; &c., I have in the main followed the nomenclature proposed by Prof. Huxley in his valuable paper on the brain of *Ateles paniscus* (P. Z. S. 1861, pp. 247-260, pl. xxix.), and adopted by Prof. Flower in his descriptions of the brains of *Mysetes seniculus* (P. Z. S. 1864, pp. 335-338, pl. xxix.) and *Pithecia monachus* (P. Z. S. 1862, pp. 328-331). The late Dr. Paul Broca has more recently written an elaborate article on the subject of cerebral nomenclature ("Nomenclature Cérébrale, dénomination des divisions et subdivisions des hémisphères et des anfractuosités de leur surface," Revue d'Anthropologie, (2) i. 1878, pp. 193-236). In this he endeavours to limit more strictly than has hitherto been done the terms used by various writers on the structure of the brain, and to introduce a uniform nomenclature. I have, where necessary, added his names in brackets after those here used.

(*scissure occipitale externe*) first appears externally. It is at first slightly concave forwards, then convex. At about two thirds of its course it is joined by the well-marked *antero-temporal* sulcus (*a.t.*) (*scissure parallèle*, Gratiolet; *premier sillon temporal*, Broca), which commences near the lower margin of the temporal lobe. This is a condition not found in *Ateles*, *Lagothrix*, *Myrcetes*, or *Pithecia monachus*; it is represented by Gratiolet as existing in *Cebus capucinus* (Mém. Plis Cér. Atlas, pl. x. figs. 7 & 8), and likewise occurs in *Cynocephalus*, *Macacus*, and other Old-world genera.

Embracing the upper extremity of the Sylvian fissure is a somewhat Y-shaped sulcus, the "stem" of the Y being short and springing from the median line, whilst the two arms are much longer and run downwards and outwards, and in the case of the anterior one forwards as well, onto the external surface of the hemispheres, appearing there one on each side of the upper part of the Sylvian fissure (fig. 9). The posterior of these is, no doubt, the aforesaid *temporo-occipital* sulcus (*t.o.*) (*scissure perpendiculaire externe* of Gratiolet, *scissure occipitale externe* of Broca). The anterior limb no doubt corresponds to the anterior part of the "sulcus (4) bounding the upper border of the angular gyrus, having the form of a broad pointed arch," described by Prof. Flower in *Pithecia monachus* (*l.c.* p. 330). A comparatively slight modification of the condition of these parts in that species as represented in his fig. 1 would bring about that which obtains in *Brachyurus*, which also is represented in Gratiolet's figures of *Cebus capucinus* and *C. apella* (*l.c.* pl. x. figs. 7 & 11). This "supraangular" (*s.a.*) sulcus defines anteriorly the well-developed angular gyrus. The union of the temporo-occipital and occipito-parietal (the two parts of the *scissure occipitale* of Broca) sulci divides off perfectly the occipital and parietal lobes; so that there is here no such superficial "pli de passage" between these two lobes as exists in *Cebus capucinus* and *Pithecia satanas*. In *P. monachus* there is, in addition, a second, more superior passage-fold between these two lobes (Flower, *l.c.*)<sup>1</sup>. In *Cebus apella* (according to Gratiolet's figure, *l.c.* pl. 10. figs. 12, 12 bis), as in *Brachyurus*, the "pli de passage" is concealed, so that superficially the two lobes appear perfectly distinct.

Anterior to the supraangular sulcus, the fissure of Rolando (*p.p.*) (*postero-parietal*, Huxley) is seen as a well-developed sulcus forming a sigmoid curve extending very nearly to the middle line. Anterior to this is the superofrontal sulcus (*s.f.*), also curved, though roughly parallel with the external border of the hemispheres. The orbital surface of the hemispheres is also marked by a somewhat H-shaped complex sulcus (*incisure en-H*). The occipital lobe is almost entirely smooth; below a sulcus is observable, curving upwards, and ending in a bifurcate manner in front of the lower termination of the occipito-temporal sulcus. Posterior to this is a very

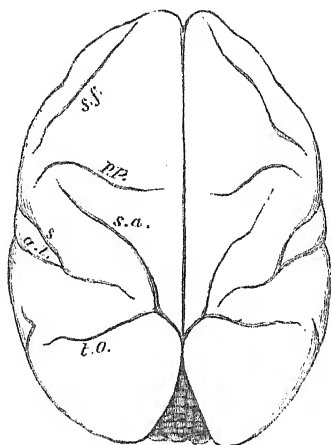
<sup>1</sup> As regards this and sundry other differences between *Pithecia monachus* and *P. satanas*, it must be remembered that the two are not perhaps strictly congeneric, *P. satanas* having been separated, with *P. chiropotes*, as a genus *Chiropotes*.



much smaller, short sulcus, easily seen internally, but only just appearing on the inferior margin of the lobe externally.

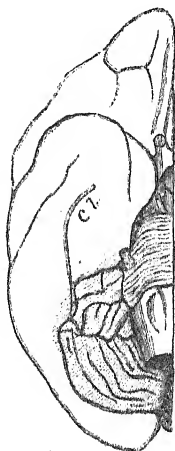
The internal surface of the hemispheres has the ordinary sulci

Fig. 7.



Brain of Red Uakari, seen from above.

Fig. 8.

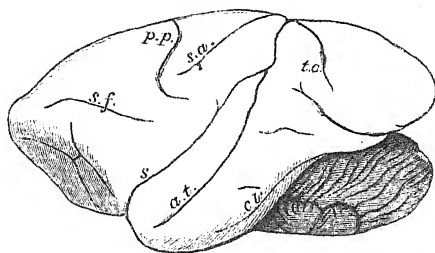


Right half of the same, seen from below.

well displayed. The callosal-marginal sulcus (*c.m.*) (*scissure sous-frontale*) somewhat broken up anteriorly, inclines posteriorly towards the margin of the hemispheres, but does not reach it by about .1 inch.

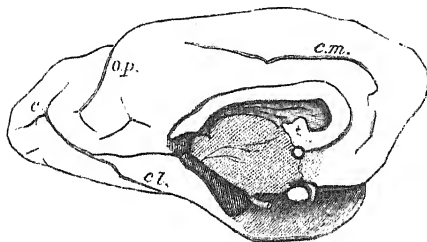
The occipito-parietal fissure (*o.p.*) (*scissure perpendiculaire interne*) is distinct, inclined first backwards, and then abruptly bent forwards for a small distance. Between its termination and the posterior end of the corpus callosum is a faintly-impressed triradiate mark. The calcarine sulcus (*c.*) is well developed, and terminates posteriorly

Fig. 9.



The same, left half, seen from the outside.

Fig. 10.



The same, from the inside; the cerebellum and medulla have been removed.  
All the figures of the natural size.

- s. Sylvian fissure; *p.p.* Postero-parietal; *s.f.* Supero-frontal; *s.a.* Supra-angular; *a.t.* Antero-temporal; *t.o.* Temporo-occipital; *c.m.* Callosomarginal; *c.* Calcarine; *c.l.* Collateral; *o.p.* Occipito-parietal.

by its characteristic fork; the point of division is .15 inch from the margin of the brain; and the upper arm is slightly longer than the lower. The sulcus is continued forwards with an upward concavity to the end of the corpus callosum, where it passes into the dentate sulcus<sup>1</sup>. At a point .3 inch in front of its bifurcation it is

<sup>1</sup> According to Broca (*Revue d'Anthrop.* viii. p. 470, 1878) the bridging convolution between the callosal and uncinate convolutions, which here interrupts the apparent continuation of the calcarine into the dentate sulcus, is nearly always present in Monkeys, although it may be deep and in some cases extremely delicate also. He considers, however, that it is wanting in the Hapalidæ. It is certainly present in *Brachyurus*, though small and deep.

joined by the collateral sulcus<sup>1</sup> (*cl*), which passes forwards and slightly outwards, so appearing on the external face of the temporal lobe (fig. 9). The temporal lobe has, in addition, a slight impression anterior and internal to this, but is otherwise quite smooth below.

The corpus callosum is well developed; it is nearly 1 inch in total length; the præcallosal part of the cerebrum is 0.45 inch, the postcallosal 0.9 inch in length.

The cerebellum is well developed; the superior vermis is 0.85 inch in length; with the lateral lobes it is altogether 1.25 inch transversely. The flocculi are large, and the pons Varolii well developed. The medulla has distinct olivary bodies.

In the general characters of its brain, as will be thus seen, *Brachyurus* approaches most nearly the genera *Cebus* and *Pithecia* (including *Chiropotes*), and especially the type found in *Cebus apella*. With *Ateles* and *Lagothrix* it has no close relationship; and the same may be said as regards *Myrcetes*; it also departs widely in the greater complication and development of the brain from *Callithrix*, *Chrysomys*, and the smaller *Cebidæ* generally.

Reviewing the facts already stated as to the structure of *Brachyurus rubicundus*, it is evident that *Brachyurus* is a perfectly good genus, more or less intimately related to a number of the larger Cebine forms, but nevertheless characterized by a combination of characters peculiarly its own. A relationship to *Myrcetes*, suggested by its external appearance and the form of the lower jaw, is not borne out by its visceral anatomy, the brain and liver both pronouncing decisively against the idea, besides other peculiarities. With *Ateles* and *Lagothrix* it has no particular features in common, but it undoubtedly approaches *Cebus* in the structure of its brain; and it is with this genus and *Pithecia* (including *Chiropotes*) that it has probably the nearest affinities.

The institution of a genus *Ouakaria* for the reception of these short-tailed Monkeys by Dr. Gray (P. Z. S. 1849, p. 9) seems to me unnecessary. As he there remarks, the genus *Brachyurus*, as originally proposed by Spix (Sim. et Vespert. Bras. p. 11), contained two species, *B. israelita* (*l. c.* pl. vii.) and *B. ouakary* (pl. viii.). The former of these is now generally referred to the genus *Pithecia*, standing as *Pithecia chiropotes* (cf. Sclater, P. Z. S. 1871, p. 228). Having examined skulls of all the known species of *Brachyurus*, as well as of *Pithecia satanas*, which is merely a repre-

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Prof. Flower says of *Myrcetes* (*l. c.* p. 337), "the dentate sulcus is continuous with the calcarine." On the other hand, in *Ateles* (cf. Huxley, *l. c.* p. 255, fig. 2) it is superficial and obvious. Broca also figures its existence in *Lagothrix* (*l. c.* p. 471, fig. 31).

<sup>1</sup> This junction, at least superficially, of the calcarine and collateral sulci I also find exists in *Cebus capucinus* (cf. also Gratiolet's figure, Atlas, pl. x. fig. 9) and *Pithecia satanas*; in *Ateles* and *Nyctipithecus*, &c., however, it does not exist, as far as I have seen, nor do I find any allusion to such a condition existing at all in any of the memoirs already quoted on the brain of Primates.

sentative form of *P. chiropotes*, I am unable to agree with Dr. Gray (*l. c.*) as to Spix "having evidently described the teeth &c. of his first species in his generic character," for I find the characters there given apply equally well to both the forms under consideration. Indeed, as the "character essentialis" of the genus *Brachyurus* is "*Cauda non volubili, abbreviata*," *B. israelita*, in which that organ is of the normal length, cau in no way be considered the type of the genus. With certain other points, too, of the "descriptio" there given, *B. ouakary* corresponds better than the first species. I therefore agree with Isidore Geoffroy (Expéd. Am. Sud, Mammif. p. 18) in retaining the generic name *Brachyurus*, of which *Ouakaria* thus becomes a synonym<sup>1</sup>.

As regards the species of this genus, there are three well-marked ones, each inhabiting a distinct geographical area; of each of these I have seen skins and skulls. They may be arranged as follows:—

a. *Facie nigra*.

1. BRACHYURUS MELANOCEPHALUS. (Plate LXIII.)

*Simia melanocephala* (Cacajao), Humboldt, Rec. pl. xxix. p. 317 (1811).

*Pithecia melanocephala*, Geoffr. Ann. Mus. xix. p. 117 (1812).

*Brachyurus ouakary*, Spix, Sim. et Vesp. Bras. p. 12, pl. viii. (1823).

*Ouakaria spixii*, Gray, P. Z. S. 1849, p. 10, fig.

*Ouakaria melanocephala*, Gray, Cat. Monkeys &c. p. 62 (1870).

*Pithecia melanocephala*, Schlegel, Mus. P.-B. vii. p. 227 (1876).

*Ater, dorso lateribusque cum brachiis posticis plus minusve castaneo-brunneis.*

*Hab.* Forests traversed by the Casiquiare and Rio Negro (*Humboldt*); forests between the Solimoes and Ica (*Spix*); Marabitanas, Rio Negro, and Moura, Rio Branco (*Natterer, fide Pelzeln apud Schegel, l. c.*).

This species is at once distinguishable by its black face, as well as by the black hands, feet, &c. It is the most northern form of the three, and apparently the most wide-spreading also. No doubt it is the "black-faced, grey-haired" species heard of, but not obtained, by Mr. Bates as being found "180 miles from the mouth of the Japurá" (*Nat. Amaz. ii. p. 313*).

Of this species we have, at different times, had two specimens living in the Gardens (*vide* Sclater, P. Z. S. 1870, p. 1). From

<sup>1</sup> The name *Brachyurus* has also been used, but erroneously (*cf.* Sclater, 'Ibis,' 1877, p. 260), for the Ant-Thrushes (*Pitta*). Mr. Alston has, since this paper was read, pointed out to me that the same term also had been proposed some years previously to Spix by Fischer ('Zoognosia,' i. p. 24) for a genus of Rodentia (1813). As, however, this name has never, I believe, been adopted for use in that group, it seems to me quite unnecessary, on that ground, to reject the name for the Uakaris. Purists will have, I suppose, to adopt Lesson's barbarous term, proposed as a subgenus, *Cacajao* (*Species des Mammifères*, p. 181, 1840).

the first of these the water-colour drawing by Richter in the Society's possession, which is here reproduced on a diminished scale (Plate LXIII.), was taken. In all probability it is the skin and skeleton of this individual which are now preserved in the British Museum. [The stuffed skin is marked "Zool. Soc.'s collection," the skeleton 806 b.]

b. *Facie rubra.*

2. *BRACHYURUS CALVUS.*

*Brachyurus calvus*, Isid. Geoffr. C. R. xxiv. p. 576 (1847), et Arch. Mus. v. p. 560; Expéd. Amer. Sud, Mammif. p. 17, pl. 4. fig. 1 (1855).

*Ouakaria calvus* (sic), Gray, P. Z. S. 1849, p. 10.

*Ouakaria calva*, Gray, Cat. Monk. p. 62 (1870).

*Pithecia calva*, Schl. Mus. P.-B. vii. p. 228 (1876).

*Pithecia alba*, Schl. Mus. P.-B. vii. p. 229 (1876).

*Corpore fulvido-albicante, subtus saturatiore.*

*Hab.* Opposite Fonteboa (*Castelnau & Deville*); banks of the Japurá delta, west of its mouth (*Bates*).

According to Castelnau (*l. c.* p. 567), *B. calvus* is confined to the forests lying on the north bank of the Amazons, between the rivers Putumayo (or Ica) and Japurá.

The locality "Pará," given to the species by its discoverer M. Lisboa, and also marked on the mounted specimen in the British Museum, is of course a mistake, as already pointed out by Schlegel (*l. c.* p. 226). Mr. Bates's notes on this species and the next, and their distribution, are well known to naturalists. On his short description and the figure in the second edition of the 'Naturalist,' Prof. Schlegel has attempted to found a fourth species, "*Pithecia alba*." But, in the first place, the short description given, as well as the locality, suit *B. calvus* quite well; and, secondly, there is a specimen in the British Museum, purchased of Stevens, which in all probability was one collected by Mr. Bates himself, and is quite the same as three other specimens of that species.

3. *BRACHYURUS RUBICUNDUS.* (Plates LXI., LXII.)

*Brachyurus rubicundus*, Isid. Geoffr. & Dev. C. R. xxvii. p. 498 (1848); Geoffr. Arch. Mus. v. p. 564, pl. 30; Expéd. Am. Sud, Mamm. p. 19, pl. 4. fig. 2 (head).

*Ouakaria rubicunda*, Gray, Cat. Monk. p. 62 (1870).

*Pithecia rubicunda*, Schlegel, Mus. P.-B. vii. p. 228 (1876).

*Corpore castaneo-rufa, collo pallidiore.*

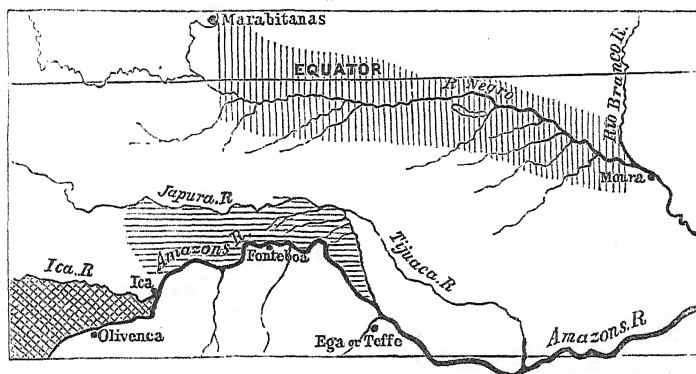
*Hab.* Forests on the north bank of the Amazons opposite Olivença, not passing eastwards of the Ica (*Castelnau*).

The exact westward extension of this species still remains unknown. The young specimen seen at Fonteboa by Bates (*l. c.* p. 313) and by him referred to this species, was more probably *B. calvus*, as we know, from Geoffroy and Castelnau's account, that the young of *B. rubicundus* resembles in coloration the adult, and is *not* paler.




Opposite Fonteboa, moreover, is exactly the locality where the French expedition obtained *B. calvus*, and is well within the limits assigned to that species by Castelnau.

*B. rubicundus* is the western representative of *B. calvus*, which it very closely resembles, but can at once be distinguished by its very different coloration, being nearly all over of a rich deep chestnut, only paler on the neck, instead of the pale sandy-white, slightly rufous below and on the inside of the limbs, of the last species. The fact of the series of individuals of each of these species

Fig. 11.



Map of part of the basin of the Amazons, to show the distribution of the Uakari Monkeys.

	Supposed area of <i>B. melanocephalus</i> .
	„ „ <i>B. calvus</i> .
	„ „ <i>B. rubicundus</i> .

obtained by Castelnau and Deville differing to no important extent amongst themselves, as well as their different ranges, clearly show that, so far as our knowledge yet goes, there is no reason whatever for considering *B. calvus* an albino form of *B. rubicundus*; moreover in *B. calvus* a considerable number of hairs on the back &c. are *black* throughout, just as in *B. rubicundus*; this would hardly be the case in an albino.

Gray's arrangement of these species in the 'Catalogue of Monkeys' has already been dealt with by Schlegel:—"Il semble, d'ailleurs, que ce savant se soit formé une idée à lui propre de ces animaux, puisque, après avoir mis les *Ouakaria rubicunda* et *calva* dans une catégorie à part, laquelle porte en tête: 'pelage blanchâtre ou rougeâtre,' il ajoute: 'albinos de l'*Ouakaria melanocephala*.' On avouera que ceci est trop fort pour le directeur d'un des plus grands établissements de Zoologie." (Mus. P.-B. p. 229).

December 14, 1880.

Prof. Flower, LL.D., F.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of November 1880:—

The total number of registered additions to the Society's Menagerie during the month of November was 116, of which 3 were by birth, 39 by presentation, 67 by purchase, 3 were received on deposit, and 4 by exchange. The total number of departures during the same period, by death and removals, was 133.

The most noticeable additions during the month of November were as follows:—

1. Two Matamora Terrapins (*Chelys matamora*), purchased November 26th. Only two examples of this singular Tortoise have been previously received.

2. A Uniform Water-snake (*Fordonia unicolor*), purchased November 29th, and new to the collection. This Snake was captured in the Hoogley by a man round whose leg it had clung when he was in the water, and was brought home in a bottle of water. It is sluggish in habit, and appears to live constantly in the water.

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Mr. Sclater exhibited the skin of the brown female of *Pauxis galeata*, formerly living in the aviary of the late Mr. G. Dawson Rowley, F.Z.S., and alluded to in Mr. Sclater's memoir on the Curassows, published in the Society's Transactions (vol. ix. p. 285). The bird having recently died, Mr. G. F. Rowley, F.Z.S., had kindly forwarded it in the flesh to Mr. Sclater. The bird had been ascertained by dissection to be a female, and was no doubt an old bird, as when Mr. G. D. Rowley wrote to Mr. Sclater on the subject in 1873 it had then been five years in Mr. Rowley's possession. There could be no doubt, therefore, that the adult female of this Curassow did not always assume the black plumage of the male, as had been observed to be the case in certain specimens.

Mr. Sclater also exhibited the trachea of the above-mentioned specimen, which was of a short and simple form instead of presenting the complications well known to occur in the male (cf. Temminck's Fig. et Gall. vol. iii. pl. iv. fig. 1).

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Dr. Günther, F.R.S., read a paper on some rare Reptiles and Batrachians now or lately living in the Society's Menagerie. The species spoken of were *Chelys fimbriata*, *Metopoceros cornutus*, *Teius rufescens*, and *Ceratophrys ornata*.

This paper will be published in the Society's 'Transactions.'

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The following papers were read:—

1. On the Application of the Laws of Evolution to the Arrangement of the Vertebrata, and more particularly of the Mammalia. By T. H. HUXLEY, F.R.S.

[Received November 23, 1880.]

There is evidence, the value of which has not been disputed, and which, in my judgment, amounts to proof, that, between the commencement of the Tertiary epoch and the present time, the group of the Equidæ has been represented by a series of forms, of which the oldest is that which departs least from the general type of structure of the higher Mammalia, while the latest is that which most widely differs from that type.

In fact, the earliest known equine animal possesses four complete subequal digits on the fore foot, three on the hind foot; the ulna is complete and distinct from the radius; the fibula is complete and distinct from the tibia; there are 44 teeth, the full number of canines being present, and the cheek-teeth having short crowns with simple patterns and early formed roots. The latest, on the other hand, has only one complete digit on each foot, the others being represented by larger or smaller rudiments; the ulna is reduced and ankylosed with the radius; the fibula is still more reduced and partially ankylosed with the tibia; the canine teeth are partially or completely suppressed in the females; the first cheek-teeth usually remain undeveloped, and when they appear are very small; the other cheek-teeth have long crowns with highly complicated patterns and late-formed roots. The Equidæ of intermediate age exhibit intermediate characters.

With respect to the interpretation of these facts, two hypotheses, and only two, appear to be imaginable. The one assumes that these successive forms of equine animals have come into existence independently of one another. The other assumes that they are the result of the gradual modification undergone by the successive members of a continuous line of ancestry.

As I am not aware that any zoologist maintains the first hypothesis, I do not feel called upon to discuss it. The adoption of the second, however, is equivalent to the acceptance of the doctrine of evolution, so far as Horses are concerned; and, in the absence of evidence to the contrary, I shall suppose that it is accepted.

Thus, since the commencement of the Eocene epoch, the animals which constitute the family of the Equidæ have undergone processes of modification of three kinds:—

1. There has been an excess of development of some parts in relation to others.

2. Certain parts have undergone complete or partial suppression.

3. Certain parts, which were originally distinct, have coalesced.

Employing the term "law" simply in the sense of a general statement of facts ascertained by observation, I shall speak of these



three processes by which the *Eohippus* form has passed into *Equus* as the expression of a threefold law of evolution.

It is of profound interest to remark that this law, or generalized statement of the nature of the ancestral evolution of the Horses, is precisely the same as that which formulates the process of individual development in animals generally, from the period at which the broad characters of the group to which an animal belongs are discernible, onwards. After a mammalian embryo, for example, has taken on its general mammalian characters, its further progress towards its specific form is effected by the excessive growth of one part in relation to another, by the arrest of growth or the suppression of parts already formed, and by the coalescence of parts primarily distinct.

This coincidence of the laws of ancestral and individual development creates a strong confidence in the general validity of the former; and a belief that we may safely employ it in reasoning deductively from the known to the unknown. The astronomer who has determined three places of a new planet, calculates its place at any epoch however remote; and if the law of evolution is to be depended upon, the zoologist who knows a certain length of the course of that evolution in any given case, may with equal justice reason backwards to the earlier but unknown stages.

Applying this method to the case of the Horse, I do not see that there is any reason to doubt that the Eocene *Equide* were preceded by Mesozoic forms which differed from *Eohippus* in the same way as *Eohippus* differs from *Equus*. And thus we are necessitated to conceive of a first term of the Equine series, which, if the law is of general validity, must needs have been provided with five subequal digits on each plantigrade foot, with complete, subequal antibrachial and crural bones, with clavicles, and with, at fewest, 44 teeth, the cheek-teeth having short crowns and simple-ridged or tuberculated patterns. Moreover, since Lartet's and Marsh's investigations have shown that the older forms of any given mammalian group have less developed cerebral hemispheres than the later, there is a *prima facie* probability that this primordial Hippoid had a low form of brain. Further, since the existing Horse has a diffuse allantoic placentation, the primary form could not have presented a higher, and may have possessed a lower, condition of the various modes by which the fœtus derives nourishment from the parent among vertebrated animals.

Such an animal as this, however, would find no place in any of our systems of classification of the Mammalia. It would come nearest to the *Lemuroidea* and the *Insectivora*, though the non-prehensile pes would separate it from the former, and the placentation from the latter group.

A natural classification is one which associates together all those forms which are closely allied and separates them from the rest. But, whether in the ordinary sense of the word "alliance," or in its purely morphological sense, it is impossible to imagine groups of animals more closely allied than the primordial Hippoids are with their descendants. Yet, according to existing arrangements, the ancestors

would have to be placed in one order of the class Mammalia and their descendants in another.

It may be suggested that it might be as well to wait until the primordial Hippoid is discovered before discussing the difficulties which will be created by its appearance. But the truth is, that the problem is already pressing in another shape. Numerous "Lemurs," with marked ungulate characters, are being discovered in the older Tertiaries of the United States and elsewhere; and no one can study the more ancient mammals with which we are already acquainted, without being constantly struck with the "Insectivorous" characters which they present. In fact, there is nothing in the dentition of either Primates, Carnivores, or Ungulates which is not foreshadowed in the Insectivora; and I am not aware that there is any means of deciding whether a given fossil skeleton, with skull, teeth, and limbs almost complete, ought to be ranged with the Lemurs, the Insectivores, the Carnivores, or the Ungulates.

In whatever order of Mammals a sufficiently long series of forms has come to light, they illustrate the threefold law of evolution as clearly, though perhaps not so strikingly, as the Equine series does. Carnivores, Artiodactyles, and Perissodactyles all tend, as we trace them back through the Tertiary epoch, towards less modified forms which will fit into none of the recognized orders, but come closer to the Insectivora than to any other. It would, however, be most inconvenient and misleading to term these primordial forms "Insectivora," the mammals so called being themselves more or less specialized modifications of the same common type; and only, in a partial and limited sense, representatives of that type.

The root of the matter appears to me to be that the palæontological facts which have come to light in the course of the last ten or fifteen years have completely broken down existing taxonomical conceptions, and that attempts to construct fresh classifications upon the old model are necessarily futile.

The Cuvierian method, which most modern classifiers up to the time of the appearance of Haeckel's 'Generelle Morphologie' have followed, has been of immense value in leading to the close investigation and the clear statement of the anatomical characters of animals. But its principle, the construction of sharp logical categories defined by such characters, was sapped when Von Baer showed that, in estimating the likenesses and unlikenesses of animals, development must be fully taken into account; and if the importance of individual development is admitted, that of ancestral development necessarily follows.

If the end of all zoological classification is the clear and concise expression of the morphological resemblances and differences of animals, then all such resemblances must have a taxonomic value. But they fall under three heads:—(1) those of adult individuals; (2) those of successive stages of embryological development or individual evolution; (3) those of successive stages of the evolution of the species, or ancestral evolution.

An arrangement is "natural" (that is, logically justifiable in view

of the purpose of classification defined above) exactly in so far as it expresses the relations of likeness and unlikeness enumerated under these heads. Hence, in attempting to classify the Mammalia, we must take into account not only their adult and embryogenetic characters, but their morphological relations, in so far as the several groups represent different stages of evolution. And thus, just as the persistent antagonism of Cuvier and his school to the essence of Lamarck's teachings (imperfect and objectionable as these often were in their accidents) turns out to have been a reactionary mistake, so Cuvier's no less definite repudiation of Bonnet's "échelle des êtres" must be regarded as another unfortunate effort to oppose the development of just biological conceptions. For though no one will pretend to defend Bonnet's "échelle" at the present day, the existence of a "scala animantium" is a necessary consequence of the doctrine of evolution; and its establishment constitutes, I believe, the foundation of scientific taxonomy.

If all the Mammalia are the results of a process of evolution analogous to that which has taken place in the case of the Equidæ, and if they exhibit different degrees of that process, then a natural classification will arrange them, in the first instance, according to the place which they occupy in the scale of evolution of the mammalian type, or the particular rung of the "scala mammalium" on which they stand. The determination of the position thus occupied by any group may, I think, be effected by the deductive application of the laws of evolution. That is to say, those groups which approach the non-mammalian Vertebrata most closely, present least inequality of development, least suppression and least coalescence of the fundamental parts of the type, must belong to earlier stages of evolution; while those which exhibit the contrary characters must appertain to later stages.

Judged from this point of view, there can be no doubt that the Monotremes embody that type of structure which constitutes the earliest stage of mammalian organization:—

1. The mammary glands are devoid of teats; and thus the essential feature of the mammal could hardly be presented under a simpler form.

2. There is a complete and deep cloaca, as in Vertebrata lower in the scale.

3. The openings of the ureters are *hypocystic*; that is to say, they open not into the bladder of these animals, but behind it, into the dorsal wall of the genito-urinary passage. As this answers to the neck of the allantois, the ureters of the Monotremes retain their primitive embryonic position.

4. There is no vagina apart from the genito-urinary passage; and the oviducts are not differentiated into distinct uterine and Fallopian regions.

5. The penis and the clitoris are attached to the ventral wall of the cloaca.

6. The epiphyses of the vertebræ are but slightly, or not at all, developed<sup>1</sup>.

<sup>1</sup> Dr. Albrecht ("Die Epiphysen und die Amphiomphalie der Säugethier-

7. The malleus is relatively very large; and the "processus gracilis," which is singularly long and strong, passes between the tympanic and the periotic bones to the pterygoid, with which it is firmly united. Thus the palato-ptyergoid apparatus is directly connected by a "suspensorium" with the periotic, as in the Amphibia and Sauropsida. As in these, the representative of the incus is extremely small, and that of the stapes columelliform.

8. The coracoid is complete, distinct, and articulates with the sternum.

9. The hip-girdle is provided with large epipubes; and the iliac axis is inclined at a large angle to the sacral axis.

10. The corpus callosum is very small.

11. There appears to be no allantoic placenta, though, from the obvious remains of the ductus arteriosus and of the hypogastric arteries, there can be little doubt that the foetus has a large respiratory allantois. It is quite possible that, with a large umbilical sac, there may be an imperfect "umbilical" placentation.

But, while the *Ornithorhynchus* and the *Echidna* are thus the representatives of the lowest stage of the evolution of the Mammalia, I conceive it to be equally unquestionable that, as Haeckel has already suggested, they are greatly modified forms of that stage—*Echidna*, on the whole, representing a greater, and *Ornithorhynchus* a less, departure from the general type. The absence of true teeth in both genera is an obvious sign of extreme modification. The long tongue, extraordinary external auditory passages, and relatively large convoluted brain of *Echidna*, and the cheek-pouches and horny mouthplates of *Ornithorhynchus*, are other indications of the same kind.

Hence the primary mammals, which were less modified, and the existence of which is necessarily postulated in the conception of the evolution of the group, cannot, without risk of confusion, be called Monotremata or Ornithodelphia, since in all probability they were as widely different from *Ornithorhynchus* and *Echidna* as the Insectivora are from the Edentata, or the Ungulata from *Rhynchina*. Hence it will be convenient to have a distinct name, *Prototheria*, for the group which includes these, at present, hypothetical embodiments of that lowest stage of the mammalian type, of which the existing Monotremes are the only known representatives.

A similar reasoning applies to the Marsupialia. In their essential and fundamental characters they occupy an intermediate position between the Prototheria and the higher mammals.

1. The mammary glands are provided with teats.

2. The cloaca is so greatly reduced that it is often said to have disappeared.

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Wirbelkörper," Zoologischer Anzeiger, 1879, No. 18), while admitting that *Echidna* has no epiphyses, describes epiphyses of an incomplete character between the posterior twelve caudal vertebrae of *Ornithorhynchus*. So far as I am aware, the memoir, of which Dr. Albrecht has given a preliminary notice, has not yet been published; I content myself therefore with remarking that my own recent observations are in harmony with Dr. Albrecht's statement,

3. The openings of the ureters are *entocystic*; that is to say, the ureters open into what is called the "base" of the bladder, in front of the narrowed "neck" by which it passes into the tubular "urethra." This means, I conceive, that, morphologically, the bladder of the Marsupial represents the bladder of the Monotreme + the anterior part of the genito-urinary passage—the so-called "trigonum," if not more, of the bladder of the Marsupial, being the homologue of that anterior segment of the genito-urinary passage of the Monotreme.

4. There is a distinct and long vagina, quite separated from the cystic urethra, in the female; and the oviducts are differentiated into uterine and Fallopian portions.

5. The penis is large, and the corpora cavernosa are connected by fibrous tissue and muscles with the pelvis. The spongy body has a large bifurcated bulb; and Cowper's glands are very largely developed.

6. The vertebræ have distinct epiphyses.

7. The malleus is small; and its connexions are similar to those which it possesses in the higher mammals. The incus is relatively larger, and the stapes more or less stirrup-shaped.

8. The coracoid is short, does not articulate with the sternum, and becomes ankylosed with the scapula.

9. The hip-girdle is provided with epipubes, usually of large size and well ossified; and the iliac axis is inclined at a small angle to the sacral axis.

10. The corpus callosum is small.

11. In the few forms of which the foetus is known there is no allantoic placenta; while the umbilical sac is so large that the possibility of the existence of a transitory umbilical placentation must be taken into account.

It will be observed that in the characters 1, 2, 3, 4, 5, 6, 7, 8, and the latter part of the 9th, the Marsupials agree with the higher mammals; while in the former part of the 9th, the 10th, and the 11th they present Prototherian characters. So far, therefore, they constitute an intermediate type between that of the Prototheria and that of the higher mammals, which may be termed that of the *Metatheria*. And if there were any known animals which combined these characters, with a complete double dentition, unmodified pentadactyle manus and pes, and normal uterogestation, they would furnish us with the exact transition between the Prototheria and the higher mammals, which must have existed if the law of evolution is trustworthy.

No known Marsupial, however, possesses these additional characters. None has more than a single successional tooth on each side of each jaw; and, as Prof. Flower (to whom we owe the highly important demonstration of this fact) has pointed out, the question arises whether we have here a primary dentition with only one secondary tooth, or a secondary dentition with only one tooth of the primary set left. I have no doubt that the answer given to this question by Prof. Flower is correct, and that it is the milk-

dentition of which only a vestige is left in the Marsupialia. Among existing Rodents, in fact, all conditions of the milk-dentition exist, from a number equal to that of the permanent incisors and premolars (as in the Rabbit<sup>1</sup>) to none at all.

The same thing is observed in the Insectivora, where the Hedgehog, and probably *Centetes*, have a full set of milk-teeth, while none have yet been found in the Shrews. In these cases it is obvious that the milk-dentition has gradually been suppressed in the more modified forms; and I think that there can be no reasonable doubt that the existing Marsupials have undergone a like suppression of the deciduous teeth, in the course of their derivation from ancestors which possessed a full set.

Again, no existing Marsupial possesses an unmodified pentadactyle pes. If the hallux is present, it presents an extensive movement in adduction and abduction; in fact, the pes is prehensile. This is the case in the *Phascologyidæ*, *Phalangistidæ*, *Phascolarctidæ*, and *Didelphidæ*. The *Dasyuridæ* present the same type of pes, with the hallux reduced or suppressed. Hence, considering the relations of the *Macropodidæ* and the *Peramelidæ* with the Phalangiers, it seems likely that the hind foot in these groups is also a reduced prehensile pes; in which case this special modification of the foot would characterize the whole of the existing *Marsupialia*.

Thirdly, the most marked peculiarities of the reproductive organs and processes in the Marsupial are in no wise transitional, but are singularly specialized characters. The suspension of the scrotum in front of the root of the penis is unlike any arrangement in the higher mammals; and the development of the bulb and of Cowper's glands is in excess of any thing observable in them. In the female, the cystic urethra is as completely separated from the vagina as it is in the higher mammals; while the doubling of the vagina must, in my opinion, also be considered a special peculiarity which leads from, rather than towards, the higher mammals. In a Monotreme, in fact, the anterior end of the genito-urinary passage exhibits two very short dilatations or cornua, one on each side. In the middle line, a little distance behind these, the ureters open on a prominent ridge-like papilla. The opening of the bladder lies in front of and below the genital cornua. Now, if we compare this arrangement with that which obtains in the lower forms of the higher Mammalia, we find that the ureteric papillæ have separated laterally and moved forwards, in such a manner as to occupy the base of the bladder, and the genital cornua come to lie behind and somewhat dorsad of them. At the same time a longitudinal separation has taken place between what may be called the "ureteric" region of the

<sup>1</sup> The deciduous molars and the posterior deciduous upper incisors of the Rabbit have long been known. But I have recently found that unborn Rabbits possess, in addition, two anterior upper and two lower deciduous incisors. Both are simple conical teeth, the sacs of which are merely embedded in the gum. The upper is not more than one hundredth of an inch long, the lower rather larger. It would be interesting to examine fetal Guinea-pigs in relation to this point; at present they are known to possess only the hindmost deciduous molars, and, so far, agree with the Marsupials.

genito-urinary passage and the "genital" region. The first is taken into the bladder and becomes connected by a longer or shorter "cystic urethra" with the latter, which is converted into the longer or shorter vagina. In the Marsupial the same general modification has taken place; but the "genital cornua" become immensely elongated, and give rise to the so-called "double" vagina.

Lastly, the marsupium, where it exists, is a no less special feature of the Marsupialia, and, like the peculiarities of the female genital organs, appears to be related with the abnormally early birth of the foetus. Among the higher Mammalia, it is well known that the foetus is born in a relatively much earlier state in some cases than in others, even among closely allied species. Thus Rabbits are born hairless and blind, while Hares are born hairy and with their eyes open. I think it probable, from the character of the pes, that the primitive forms, whence the existing Marsupialia have been derived, were arboreal animals; and it is not difficult, I conceive, to see that, with such habits, it may have been highly advantageous to an animal to get rid of its young from the interior of its body at as early a period of development as possible, and to supply it with nourishment during the later periods through the lacteal glands, rather than through an imperfect form of placenta.

However this may be, the characters of the existing Marsupialia leave no doubt on my mind that they are greatly modified members of the metatherial type; and I suspect that most, if not all, of the Australian forms are of comparatively late origin. I think it probable that the great majority of the Metatheria, of which I doubt not a great multitude will shortly be discovered in Mesozoic formations, differed widely from our existing Marsupials—not only lacking the pouch, as do some existing "Marsupialia," but possessing undivided vaginae, and probably bringing forth their young not earlier than existing Carnivores and Rodents do, the nutrition of the foetus during prolonged gestation being provided for, in all probability, by an umbilical placental apparatus, and its respiration by a non-placental allantois.

In the remaining group of the Mammalia, hitherto spoken of as the "higher Mammalia,"—

1. The mammary glands are provided with teats<sup>1</sup>.
2. The cloaca has usually disappeared. Sometimes, however (Beavers, Sloths), a shallow cloaca is present, especially in the female.
3. The openings of the ureters are always entocystic; but their position varies greatly, from close to the neck (e. g. *Sorex*) to the anterior end of the bladder (e. g. *Hyrax*).
4. There is a distinct vagina, which is almost always undivided. The oviducts are differentiated into uterine and Fallopian portions.
5. The penis is usually large, the bulb single or partially divided, and the corpora cavernosa almost always directly attached to the ischia.

<sup>1</sup> The only exception known to me is the Cape Mole (*Chrysochloris*), which, according to Peters, has none.

6. The vertebræ have epiphyses.

7. The malleus is usually small, the incus relatively large, the stapes stirrup-shaped.

8. The coracoid is almost always much reduced, and it is ankylosed with the scapula.

9. The iliac axis makes a small angle with the sacral axis; and there is no epipubis, or only a fibrous vestige of it.

10. The corpus callosum and the anterior commissure vary widely. In such forms as *Erinaceus* and *Dusypus* they are almost Monotreme-like.

11. The fœtus is connected with the uterus of the mother by an allantoic placenta. The umbilical sac varies in size; and in some lower forms (e. g. *Lepus*) it is, at first, highly vascular, and perhaps plays a quasi-placental part during the early stages of development.

It is obvious that, in all these respects, we have the mammalian type in a higher stage of evolution than that presented by the Prototheria and the Metatheria. Hence we may term forms which have reached this stage the *Eutheria*.

It is a fact, curiously in accordance with what might be expected on evolutionary principles, that while the existing members of the Prototheria and the Metatheria are all extremely modified, there are certain forms of living Eutheria which depart but little from the general type. For example, if *Gymnura* possessed a diffuse placentation, it would be an excellent representative of an undifferentiated Eutherian. Many years ago, in my lectures at the Royal College of Surgeons, I particularly insisted on the central position of the Insectivora among the higher Mammalia; and further study of this order and of the Rodentia has only strengthened my conviction, that any one who is acquainted with the range of variation of structure in these groups possesses the key to every peculiarity which is met with in the Primates, the Carnivora, and the Ungulata. Given the common plan of the Insectivora and of the Rodentia, and granting that the modifications of the structure of the limbs, of the brain, and of the alimentary and reproductive viscera which occur among them may exist and accumulate elsewhere, and the derivation of all the *Eutheria* from animals which, except for their simpler placentation, would be Insectivores, is a simple deduction from the law of evolution.

There is no known Monotreme which is not vastly more different from the Prototherian type, and no Marsupial which has not far more widely departed from the Metatherian type, than *Gymnura* or, indeed, *Erinaceus*, have from the Eutherian type.

The broadest physiological distinction between the Prototheria, the Metatheria, and the Eutheria, respectively, lies in the differences which the arrangements for prolonging the period of intra-uterine and extra-uterine nutrition by the parent present in each. The possibility of a higher differentiation of the species is apparently closely connected with the length of this period. Similarly, the broadest morphological distinction which can be drawn among the *Eutheria* lies in their placentation. All forms of deciduate placentation commence by being non-deciduate; and the intimate connexion



of the foetal with the maternal structures is subsequent to their loose union. Hence *Eutheria*, with deciduate placentæ, are in a higher stage of evolution than those with non-deciduate placentæ.

In discussing the relations of the various existing groups of the higher Mammalia with one another, it would be a mistake to attempt to trace any direct genetic connexion between them. Each, as the case of the Equidæ suggests, has probably had a peculiar line of ancestry; and, in these lines, Eutherian forms with deciduate placentation constitute the latest term, Eutherian forms with non-deciduate placentation the next latest, Metatherian forms the next, Prototherian forms the earliest among those animals which, according to existing definition, would be regarded as Mammals.

The accompanying Table (p. 659) presents, at a glance, the arrangement of the Mammalia in accordance with the views which I have endeavoured to express. The sign O marks the places on the scheme which are occupied by known Mammals; while X indicates the groups of which nothing is known, but the former existence of which is deducible from the law of evolution.

I venture to express a confident expectation that investigation into the Mammalian fauna of the Mesozoic epoch will sooner or later fill up these blanks. But if deduction from the law of evolution is to be justified thus far, it may be trusted much further. If we may confidently expect that *Eohippus* had a pentadactyle clavicate ancestor, then we may expect, with no less confidence, that the *Prototheria* proceeded from ancestors which were not mammals—in so far as they had no mammary glands, and in so far as the mandible was articulated with a quadrate bone, of which the malleus of the true mammal is the reduced representative. Probably also the corpus callosum had not appeared as a distinct structure.

Our existing classifications have no place for this "submammalian" stage of evolution (already indicated by Haeckel under the name of *Promammale*). It would be separated from the Sauropsida by its two condyles, and by the retention of the left as the principal aortic arch; while it would probably be no less differentiated from the Amphibia by the presence of an amnion and the absence of branchiæ at any period of life. I propose to term the representatives of this stage *Hypotheria*; and I do not doubt that when we have a fuller knowledge of the terrestrial Vertebrata of the later palæozoic epochs, forms belonging to this stage will be found among them. Now, if we take away from the *Hypotheria* the amnion and the corpus callosum, and add the functional branchiæ—the existence of which in the ancestors of the Mammalia is as clearly indicated by their visceral arches and clefts, as the existence of complete clavicles in the ancestral Canidæ is indicated by their vestiges in the dog—the *Hypotheria*, thus reduced, at once take their place among the Amphibia. For the presence of branchiæ implies that of an incompletely divided ventricle and of numerous aortic arches, such as exist in the mammalian embryo, but are more or less completely suppressed in the course of its development.

Thus I regard the Amphibian type as the representative of the

Stages of Evolution.		MAMMALIA.											
HYPOTHERIA.	PROTHERIA.	METATHERIA.	EUTHERIA ...										
				<div>1. Teats. 2. Allantoic placenta. 3. Uterine apertures entocystic. 4. Small malleus. 5. Reduced cornicoid. 6. Epiphibis rudimentary or absent. 7. Two occipital condyles and an osseous basioccipital. 8. Amnion present. 9. A corpus callosum. 10. No branchie.</div>									
				<div>1, 3, 4, 5, 7, 8, 9, 10 as above. ii and vi. as below. 7, 8, 9, 10 as above. i. No teats. ii. No allantoic placenta. iii. Uterine apertures hypocystic. iv. Large malleus. v. Complete cornicoid. vi. Large epiphibes. 7, 8, i, ii, iii, iv, v, vi. as above. a. No mammary gland. b. Mandible articulating with quadrate. c. No corpus callosum.</div>									
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next lower stage of vertebrate evolution; and it is extremely interesting to observe that even the existing Amphibia present us with almost every degree of modification of the type, from such forms as the oviparous, branchiate, small-lunged *Siredon* and *Menobranchus*, which stand in the same relation to it as *Gymnura* to the Eutheria, to the exclusively air-breathing Salamanders and Frogs, in which the period of intraovular development, either within the uterus itself or in special receptacles, may be as much prolonged as it is in the Mammalia.

A careful study, on full materials, of the development of the young of such forms as *Hylodes* will probably throw great light on the nature of the changes which ended in the suppression of the branchiæ, and the development of the amnion and of the extra-abdominal part of the allantois in the fœtus of the higher Vertebrata.

The recent researches of Boas<sup>1</sup> on the structure of the heart and the origin of the pulmonary arteries of *Ceratodus* fell into my hands when I happened to be working afresh at the subject, and had arrived, so far as the heart is concerned, at results which are entirely confirmatory of his. This wonderful creature seems contrived for the illustration of the doctrine of Evolution. Equally good arguments might be adduced for the assertion that it is an amphibian or a fish, or both, or neither—the reason of this being that, as it appears to me, *Ceratodus* is an extraordinarily little-modified representative of that particular stage of vertebrate evolution of which both the typical Fishes and the typical Amphibia are special modifications. I think it will be convenient to have a name for the representatives of this stage; and I propose that of *Herpetichthyes*.

If we were to take away from *Ceratodus* the membrane-bones of the head and the pneumatocœle, and slightly simplify the structure of the heart, the result would be an animal which would undoubtedly be classed among the *Chimeroidei*; and if, in such a Chimæroid, the lamellar septa of the branchiæ were not reduced, as they are in the Chimæroids, while the opercular fold remained undeveloped, the product would be a little-modified representative of the Selachian group, to which, among actually known forms, *Heptanchus* and *Cestracion* present the nearest approximations. Vertebrated animals in this stage of evolution may be termed *Chondrichthyes*.

Suppose the limbs and the genital ducts of the Chondrichthyan stage to be undeveloped, and let the two nasal sacs be represented by a partially divided sac with a single external aperture, the result will be a still lower grade of vertebrate life, which may be termed *Myzichthyes*, represented only by the greatly modified Lampreys and Hags of the existing fauna.

Finally, let the head retain its primitive segmentation, and the heart its primitive character of a contractile tube, and we reach, in the *Hypichthyes*, a stage of simplification of the vertebrate type, from which it would be difficult to remove any essential feature without reaching a point at which it is questionable whether an

<sup>1</sup> Ueber Herz und Arterienbogen bei *Ceratodus* und *Protopterus*," Morph. Jahrbuch, 1880.

animal should be called "vertebrate." This stage is at present represented only by a singularly modified form, the living *Amphioxus*.

Thus, in the order of Evolution all the Vertebrata hitherto considered may be arranged in nine stages:—1, that of the *Hypichthyes*; 2, that of the *Myzichthyes*; 3, that of the *Chondrichthyes*; 4, that of the *Herpetichthyes*; 5, that of the *Amphibia*; 6, that of the *Hypotheria*; 7, that of the *Prototheria*; 8, that of the *Metatheria*; and, 9, that of the *Eutheria*. All these stages, except that of the *Hypotheria*, are represented by existing groups of vertebrated animals, which in most cases are composed of greatly modified forms of the type to which they belong, only the *Amphibia* and the *Eutheria* exhibiting near approximations to the unmodified type in some of their existing members.

It will be observed that I have omitted to mention the Ganoid and the Teleostean Fishes and the Sauropsida. I have done so because they appear to me to lie off the main line of evolution—to represent, as it were, side tracks starting from certain points of that line. The Ganoidei and the Teleostei I conceive to stand in this relation to the stage of the *Herpetichthyes*, and the Sauropsida to the stage of the *Amphibia*.

There is nothing, so far as I can see, in the organization of the Ganoid and Teleostean fishes which is not readily explicable by the application of the law of Evolution to the *Herpetichthyes*. They may be interpreted as effects of the excessive development, reduction, or coalescence of the parts of a *Herpetichthyan*<sup>1</sup>.

Similarly, the suppression of the branchiæ, the development of an amnion, and of a respiratory extra-abdominal allantois, and that enlargement of the basioccipital relatively to the exoccipitals which gives rise to a single skull-condyle, is all the change required to convert a Urodele Amphibian into a Lizard. It is needless to recapitulate the evidence of the transition from the Reptilian to the Bird type which the study of extinct animal remains has brought to light.

The scheme of arrangement of the Vertebrata which naturally flows from the considerations now brought forward will stand thus:—

<sup>1</sup> That the heart of *Butirinus* affords a complete transition between the characteristically Ganoid and the characteristically Teleostean heart, has recently been proved by Boas (*Morphol. Jahrbuch*). Thus the last remnant of the supposed hiatus between the Ganoids and the Teleosteans vanishes.

Stages of Evolution.		Representative Groups.		
9. <i>Eutheria</i> .....	<i>Monodelphia</i> .			
	O			
8. <i>Metatheria</i> .....	<i>Marsupialia</i> .			
	O			
7. <i>Prototheria</i> .....	<i>Monotremata</i> .			
	O			
6. <i>Hypotheria</i> .....	×	.....	<i>Sauropsida</i> ..	{ <i>Aves</i> . <i>Reptilia</i> .
			O	
5. <i>Amphibia</i> .....	<i>Amphibia</i> .....	×		
	O			
4. <i>Herpetichthyes</i> ...	<i>Dipnoi</i> .....	×	...	<i>Osteichthyes</i> ... { <i>Ganoidei</i> . <i>Teleostei</i> .
	O			O
3. <i>Chondrichthyes</i> ..	<i>Chimæroides</i> .....	×	...	×
	O			
	<i>Selachii</i> .	×	...	×
	O			
2. <i>Myxichthyes</i> ...	<i>Marsipobranchii</i> ...	×	...	×
	O			
1. <i>Hypichthyes</i> ...	<i>Pharyngobranchii</i> ...	×	...	×
	O			

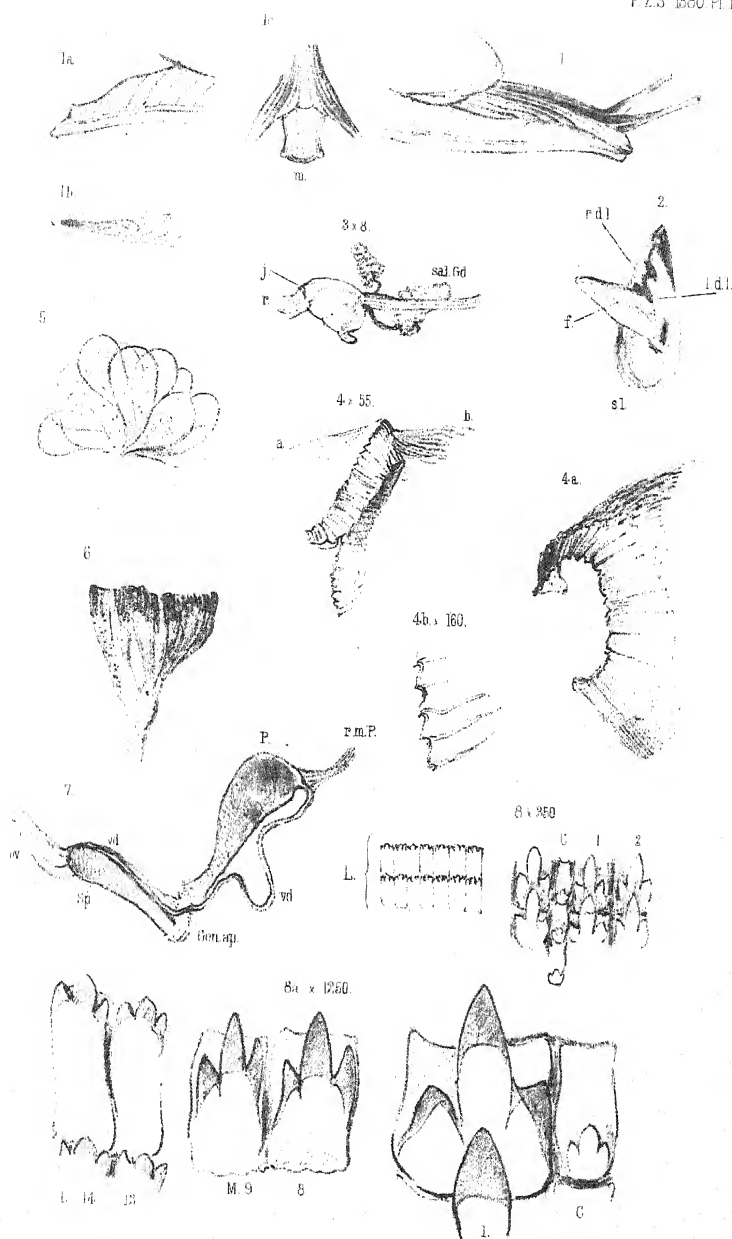
It appears to me that every thing which is at present known respecting the Vertebrata of past epochs agrees with the assumption that the law which expresses the process of ancestral evolution of the higher Mammalia is of general application to all the Vertebrata. If this is admitted, I think it necessarily follows that the Vertebrata must have passed successively through the stages here indicated, and that the progress of discovery, while it will obliterate the lines of demarcation between these stages, and convert them into a continuous series of small differentiations, will yield no vertebrate form for which a place does not exist in the general scheme.

2. On the Anatomy of *Ferussacia gronoviana*, Risso, from Mentone. By Lieut.-Colonel H. H. GODWIN-AUSTEN, F.R.S., F.Z.S., &c. Concluding with a Note on the Classification of the Genus and its Allies, by GEOFFREY NEVILL, C.M.Z.S.

[Received November 22, 1880.]

(Plate LXIV.)

In a communication made to this Society last year (P. Z. S. 1880, p. 133), Mr. G. Nevill's paper on the Land Shells of Mentone, I alluded, in a footnote, to having had an opportunity of examining the animal of *Ferussacia gronoviana*, which Mr. Nevill had brought home alive; the promised details are now given. The animal apparently,





for so thin and fragile a form, possesses considerable powers of vitality, as a large number of them packed together in a corked tube had survived for many weeks. It may be that, being carnivorous, they had been living on their less fortunate companions.

The animal (Pl. LXIV. fig. 1) is of a fine bright sea-green colour: the eye-tentacles are dark and thick at their bases, which are contiguous; the oral very short and blunt; muzzle retractile, and can be produced considerably. It is of darker tint at the extremity of the foot, which has a distinct mucous gland with a truncate lobe above it. There is a well-marked pedal line parallel to the edge of the foot, from which a series of regular transverse furrows extends to the dorsal side; but the intervals between these furrows are smooth, not papillate: this is seen to extend to the muzzle; but from the oral tentacles the whole upper part of the neck is strongly and longitudinally grooved. The animal when fully extended is long and narrow, end of foot equal with apex of shell when moving; and the mantle is all round slightly reflected over the thin margin of the peristome. The right dorsal lobe is small, the left is larger (fig. 2).

The odontophore (figs. 8, 8 *a*) consists of over a hundred rows of teeth, about 60 in each row, with a very considerable difference in the size of the centrals and laterals, the centre being very small, bluntly tricuspid, on an elongate oblate base; the next seven having a long pointed central tooth with the two smaller on either side; the outer laterals are minutely evenly tricuspid on broad, oblong, rectangular bases. The dental formula is 22—7—1—7—22. The jaw (figs. 4, 4 *a*, 4 *b*) is peculiar, not hard and chitinous as is usually the case, but thin and elastic, consisting of a thin membranous ribbon, closely ribbed or rather folded longitudinally, and presenting on the anterior side a zigzag or serrated edge. This elastic plicate structure of the jaw is thus quite in accord and adapted most admirably to the retractile muzzle of the animal. The buccal mass is well developed, of rounded form; the salivary ducts short, the glands of unequal size.

*Generative organs.*—The penis (fig. 7) is short, fusiform, conical near the junction of the *vas deferens*; the retractor muscle is given off close to this. The spermotheca is elongately pear-shaped. No dart-sac was observed in the three specimens examined. The ovarioles (fig. 5) in one specimen appeared to be a mass of globosely pear-shaped follicles united at their basal ends into a duct; but in two specimens (fig. 6) there was found near the apex, embedded in the livers, a dark triangular-shaped organ, which, when examined more closely, was trilobed, uniting in a single duct, streaked and coloured black along its straight terminal margin, and may possibly have consisted of closely packed bundles of spermatozoa. The hermaphrodite duct was not made out, nor the albumen-gland; and I most unaccountably did not notice the exact position, with respect to the right eye-tentacle, of the generative aperture.

This species in many respects assimilates to *Agraulina*, Bourg. (*Lovea tornatellina*, Lowe), of Madeira, described and figured by the Rev. R. Boog Watson (together with *Lovea melampoides*, *triticea*,



and *oryza*) in the Society's 'Proceedings' for 1875, p. 677 :—first, in the reflection of its mantle over the edge of the shell and the dorsal lobes, which are well developed, though not to the extent that they are in the Madeiran species (perhaps in a fresh state they may be larger in the European); secondly, and more particularly, in the truncate mucous-pored extremity of the foot; thirdly, in the dentition there is close affinity; and, fourthly, the jaw of *L. tornatellina*, though more solid, exhibits transverse striation or scoring. All the characters taken together, to say nothing of the shell, places *Lovea* (= *Agraulina*, Bourg.), and *Ferussacia* side by side, if they are not generically identical, which I am inclined to think. It is most interesting to find this very distinct genus represented both in the Mediterranean and the far distant island of Madeira.

*Note by* GEOFFREY NEVILL, C.M.Z.S.

As I hope my friend Colonel Godwin-Austen will shortly publish an account of the animal of the type species of Risso's genus *Ferussacia*, *F. gronoviana*, Risso (from specimens found by me at Mentone), it may be well to give a short account of what seems to me the correct classification of this small group, now that Colonel Godwin-Austen has shown the animal of *Ferussacia* to be possessed of a mucous pore.

Family STENOGYRIDÆ, Crosse and Fischer  
(Moll. Miss. Sci. Méxique, 1874).

A. *Animal with mucous pore.*

Genus FERUSSACIA, Risso

(Hist. Nat. Europe MÉR. 1826 : type *F. gronoviana*).

*Folliculiana*, Bourg. Rev. et Mag. Zool. 1856.

Prof. C. Semper (Reisen Philippinen, iii. p. 135) gives some details of the anatomy of the Mauritian species *Ferussacia barelayi*, Benson, P. Z. S. 1855 [as *Spiraxis* sp.]. I have already recorded in my Hand-list that I found one living sinistral specimen.

Subgenus PROCERULIANA, Bourg.

(Rev. et Mag. Zool. 1858 : type *Ferussacia procerula*, Morl.).

I have given Colonel Godwin-Austen specimens in spirit of a typical species of this well-marked group.

Subgenus AGRAULINA, Bourg.

(Rev. et Mag. Zool. 1858 : type *Ferussacia triticea*, Lowe).

Pars = *Fusillus*, Lowe, Ann. & Mag. Nat. Hist. 1852 : type *Ferussacia oryza*, Lowe, sine descr.

Pars = *Amphorella*, Lowe, l. c. : type *Ferussacia mitriformis*, Lowe, sine descr.

= *Lovea* [emend. *Lowea*], Watson, P. Z. S. 1875, p. 677 : type *Ferussacia tornatellina*, Lowe.

The animal of this group is well described and figured by the Rev. R. Boog Watson, *l. c.*

(?) Subgenus CYLICHNIDIA, Lowe

(Ann. & Mag. Nat. Hist. 1852 : types *Ferussacia leacockiana* and *F. cylichna*, Lowe, sine descr.).

The animal of these two species not being known, correct classification is necessarily rather doubtful; I have little doubt, however, that the subgenus is correctly placed here.

Subgenus HYPNOPHILA, Bourg.

(Rev. et Mag. Zool. 1858 : type *Ferussacia pupaeformis*, Cantraine).

= *Cryptazeca*, Folin, Bull. Soc. Borda, Dax, 1877 : type *Ferussacia monodonta*, Folin.

Animal admirably described (*l. c.*) by the Marquis de Folin.

(?) Subgenus HOHENWARTIANA, Bourg.

(Rev. et Mag. Zool. 1858 : type *Ferussacia hohenwarti*, Rsm.).

Another section of which the correct classification still seems very doubtful; I am inclined to think it will prove more nearly allied to *Cæcilianella* than to *Ferussacia*!

(?) Subgenus PSEUDOSTREPTOSTYLA, Nevill.

A new subgenus, which I propose for the remarkable form described in my paper on the Land-Shells of Mentone (P. Z. S. 1880, p. 134) as *Ferussacia* (?) *abnormis*. Its classification is also still very doubtful.

B. Without mucous pore.

Genus ZUA, Leach

(Syn. Brit. Moll. 1820 : type *Helix lubrica*, Müller, publication disputed; also of Gray's Manual, 1840).

= *Cionella*, Jeffr. Linn. Soc. Trans. 1830 : types *Helix lubrica*, Müll., and *Turbo tridens*, Pult., = *Azeca tridens*, fide Jeffr. 1864, Brit. Conch., should be *Cochlicopa*, Fér. Prod. 1821, &c., as restricted by Risso, 1826.

= *Cochlicopa*, section *Styloides*, Férussac, Prod. &c., 1821, part., which cannot, however, be retained as *Cochlicopa*; if maintained at all, must be applied to the marine form *Halía priamus*.

If *Zua* be not accepted, *Cionella* must be used; undoubtedly *Zua* and *Azeca* are very closely allied.

Genus AZECA, Leach

(Leach, Syn. Moll. Brit. 1820 : type *Turbo tridens*, Pulteney, publication disputed; also of Turton's Manual, 1831. = *Cionella* part.), Jeffr., *l. c.*

## EXPLANATION OF PLATE LXIV.

- Fig. 1. Animal of *Ferussacia gronoviana*, very much enlarged. 1*a*, extremity of foot, showing the mucous gland; 1*b*, the same from above; 1*c*, head viewed from above; *m*, muzzle.
2. Aperture of shell; animal withdrawn into, showing:—*r.d.l*, right dorsal lobe; *l.d.l*, left dorsal lobe; *s.l*, shell-lobe; *f*, foot.
3. Buccal mass and salivary glands; *j*, jaw.  $\times 8$  times.
4. Jaw,  $\times 55$ : *a*, anterior side; *b*, posterior, muscles of the buccal mass; 4*a*, ditto, another view still more enlarged; 4*b*, the anterior edge,  $\times 160$  times.
5. Orotestis, as seen in one individual.
6. Ditto? in two specimens.
7. Generative organs. *ov*, oviduct; *v.d*, vas deferens; *P*, penis; *sp*, spermatheca; *r.m.P*, retractor muscle of penis; *Gen. ap*, generative aperture.
8. Odontophore,  $\times 350$ ; L, outermost laterals. *Sa*,  $\times 1250$ ; C, central; M, S, 9, median; L, 13 & 14, of outermost laterals.

3. On a second Collection of Lepidoptera made in Formosa by H. E. Hobson, Esq. By ARTHUR G. BUTLER, F.L.S., F.Z.S., &c.

[Received November 24, 1880.]

It will be noticed, by a reference to my paper on Mr. Hobson's first Collection (P. Z. S. 1877, pp. 810–816), that the Heterocerous Lepidoptera were very poorly represented. On that account I wrote to Mr. Hobson, asking him to pay particular attention to the Moths, the result of which was that we received in 1879 a small case, containing 334 Lepidoptera (chiefly Heterocera), collected at Takow<sup>1</sup>. The following is an account of this series:—

## RHOPALOCERA.

## NYMPHALIDÆ.

## 1. DANAIIS LIMNIACE.

*Papilio limniace*, Cramer, Pap. Exot. i. pl. 59. figs. D, E (1779).  
One specimen of the male.

## 2. STICTOPLCÆ SWINHOEI.

*Euplœa swinhoei*, Wallace, P. Z. S. 1866, p. 358.  
A female.

## 3. STICTOPLCÆ LÆTIFICA.

*Euplœa lætifica*, Butler, P. Z. S. 1866, p. 292, pl. 29. fig. 3.  
A male specimen of this Philippine species.

## 4. MELANITIS LEDA.

*Papilio leda*, Linnæus, Syst. Nat. i. 2, p. 773 (1766).  
Three specimens.

<sup>1</sup> Thirty-three of these are described as new to science in the present paper.

## 5. MYCALESIS MINEUS.

*Papilio mineus*, Linnæus, Syst. Nat. i. 2, p. 768 (1766).

Two males, rather worn.

## 6. MYCALESIS DRUSIA.

*Papilio drusia*, Cramer, Pap. Exot. i. pl. 84. figs. C, D (1779).

One good female and a shattered pair. These three specimens show variation in the width of the submarginal whitish stripes on the under surface.

## 7. ELYMNIA NIGRESCENS.

*Elymnias nigrescens*, Butler, P. Z. S. 1871, p. 520, pl. xlii. fig. 1.

A pair. This species somewhat resembles *Stictoploea swinhoei*.

## 8. HYPOLIMNAS MISIPPUS.

*Papilio misippus*, Linnæus, Mus. Lud. Ulr. p. 264 (1764).

One male.

## 9. HYPOLIMNAS KEZIA.

*Diadema kezia*, Butler, P. Z. S. 1877, p. 812.

Two males.

## 10. ERGOLIS ARIADNE.

*Papilio ariadne*, Linnæus, Syst. Nat. i. 2, p. 778 (1766).

Five specimens.

## 11. MESSARAS ERYMANTHIS.

*Papilio erymanthis*, Drury, Ill. Exot. Ent. i. pl. 15. figs. 3, 4 (1773).

One shattered example.

## LYCÆNIDÆ.

## 12. LAMPIDES STRABO.

*Hesperia strabo*, Fabricius, Ent. Syst. iii. 1, p. 287 (1793).

A male in good condition.

## 13. LAMPIDES DEMOCRITUS.

*Hesperia democritus*, Fabricius, Ent. Syst. iii. 1, p. 285 (1793).

Two males.

## 14. LAMPIDES VARUNANA.

*Polyommatus varunana*, Moore, P. Z. S. 1865, p. 772, pl. xli. fig. 6.

Five specimens.

## 15. LAMPIDES PLINIUS.

*Hesperia plinius*, Fabricius, Ent. Syst. iii. 1, p. 284 (1793).

Two pairs, rather shattered.

16. *LYCÆNA SANGRA*.

*Polymnatus sangra*, Moore, P. Z. S. 1865, p. 772, pl. xli. fig. 8.  
A pair.

17. *LYCÆNA INDICA*.

♂ ♀. *Lycæna indica*, Murray, Trans. Ent. Soc. 1874, p. 525,  
pl. x. figs. 2, 3.

♀. Two faded specimens.

## PAPILIONIDÆ.

18. *DELIAS LUZONIENSIS*.

*Pieris luzoniensis*, Felder, Wien. ent. Monatschr. vi. p. 285 (1862).  
A fairly good male of this beautiful species.

19. *NYCHITONA NIOBE*.

*Pontia niobe*, Wallace, P. Z. S. 1866, p. 357.

One male.

20. *TERIAS HECABE*.

*Papilio hecabe*, Linnæus, Mus. Lud. Ulr. p. 249 (1764).

A rubbed male.

21. *TERIAS HOBSONI*, sp. n.

♂. Citron-yellow: primaries above with a slender chocolate-brown costal margin, a broad external chocolate border nearly as in *T. hecabe*, its apical portion broadest, the inner edge excised and forming an angle at the fifth subcostal branch, it terminates in an acute angle on the third median branch, below which the border is very deeply bisinuated, at external angle it is distinctly wider than in *T. hecabe*; secondaries with a narrow diffused squamose brown border. Wings below rather paler than above, with elongated spots outlined in brown at the end of each cell; veins terminating in blackish dots; primaries with a dot in the cell, and a few scattered brownish scales on the disk; secondaries with a few scattered brown scales indicating the ordinary markings on the disk, but very indistinctly. Expanse of wings 1 inch  $8\frac{1}{2}$  lines.

♀. Larger than the male, lemon-yellow, with similar brown borders to the primaries; secondaries, in Mr. Hobson's example, immaculate, but usually with squamose border as in the male: wings below with the discocellular markings and marginal dots as in the male, the scattered brown discal scales absent in Mr. Hobson's example, but usually present. Expanse of wings 2 inches.

One female. Mr. Moore, however, has three or four specimens from Formosa of both sexes.

22. *TERIAS UNDULIGERA*, sp. n.

♂. Bright citron-yellow. Primaries with slender dark chocolate-brown costal margin; outer border nearly as broad as in *T. hecabe*, but the apical portion not angulated but obliquely inarched and

forming five nearly equal sinuations between the subcostal and radial branches; the bisinuation on the median interspaces shallow, but distinctly marked; the border between the first median branch and the inner margin internally irregularly notched: secondaries with a regularly sinuated brown border, of medium width, between the first subcostal and second median branches: wings below nearly as in *T. hecabe*, but not quite so distinctly marked. Expanse of wings 1 inch 8 lines.

One male. This species would seem to represent *T. anemone* in Formosa; but the border of the primaries is markedly wider than in that species.

23. CATOPSILLA CHRYSEIS.

*Papilio chryseis*, Drury, Ill. Exot. Ent. pl. 12. figs. 3, 4 (1770).

Two females, representing the two varieties of that sex.

24. APPIAS FORMOSANA.

*Pieris formosana*, Wallace, P. Z. S. 1866, p. 356.

One female in fine condition.

25. PAPILIO ERITHONIUS.

*Papilio erithonius*, Cramer, Pap. Exot. iii. pl. 232. figs. A, B (1782).

One specimen.

HESPERIIDÆ.

26. PAMPHILA MATTHIAS.

*Hesperia matthias*, Fabricius, Ent. Syst. Suppl. p. 433 (1798).

A shattered male.

27. PAMPHILA BADA.

*Hesperia bada*, Moore, P. Z. S. 1878, p. 688.

Three male specimens.

28. PAMPHILA BEVANI.

*Hesperia bevani*, Moore, P. Z. S. 1878, p. 688.

Two males.

29. PAMPHILA SUNIAS.

*Pamphila sunias*, Felder, Sitzb. Ak. Wiss. math.-nat. Cl. xl. p. 462 (1860).

30. PLESIONEURA FOLUS.

*Papilio folus*, Cramer, Pap. Exot. iv. pl. 74. fig. F (1779).

One specimen.

The present collection, although it contains only 30 species of Butterflies, has added no less than 10 to the fauna of the island, namely *Danaïs limniace*, *Euploea lætiflora*, *Mycæsis mineus*, *Lampides democritus*, *Lycæna indica*, *Delias luzoniensis*, *Terias hobsoni* and *T. unduligera*, *Pamphila bada* and *P. bevani*,

*Ergolis ariadne* is probably the *E. coryta* of Wallace's paper, and *Pamphila sunias* his *P. mæsa*; therefore I have not included these. The number of species of Butterflies now known from Formosa is 80.

## HETEROCERA.

### SPHINGIDÆ.

#### 31. MACROGLOSSA NIGRIFASCIATA.

*Macroglossa nigrifasciata*, Butler, P. Z. S. 1875, p. 241, pl. xxxviii. fig. 3.

One male.

#### 32. CHÆROCAMPA ALECTO.

*Sphinx alecto*, Linnæus, Mus. Lud. Ulr. p. 357 (1764).

Four specimens.

#### 33. CHÆROCAMPA THEYLIA.

*Sphinx theylia*, Linnæus, Mus. Lud. Ulr. p. 360 (1764).

Five specimens.

#### 34. CHÆROCAMPA OLDENLANDIÆ.

*Sphinx oldenlandiæ*, Fabricius, Sp. Ins. ii. p. 148 (1781).

One female.

#### 35. PROTOPARCE ORIENTALIS.

*Protoparce orientalis*, Butler, Trans. Zool. Soc. vol. ix. p. 609 (1876).

Six specimens.

### ZYGENIDÆ.

#### 36. EUCHROMIA FRATERNA.

*Euchromia fraterna*, Butler, Journ. Linn. Soc. vol. xii. p. 364 (1876).

One example of this beautiful species. I find, by comparing it with other specimens, that my original description omitted one important character—the first black belt on the primaries, which is broad and continuous in *E. polymena* and *E. orientalis*, being here represented by two black conical dots below the median vein. The sixth segment of the abdomen is often wholly scarlet, as in *E. orientalis*, such being the case in the Formosan example before me.

### ARCTIIDÆ.

#### 37. PELOCHYTA RHODOPA.

*Amerila rhodopa*, Walker, Cat. Lep. Het. Suppl. i. p. 305 (1864).

One specimen.

#### 38. PHISSAMA TRANSIENS.

*Spilosoma transiens*, Walker, Cat. Lep. Het. iii. p. 675 (1855).

One worn female.

## LITHOSIIDÆ.

## 39. MILTOCHRISTA SINICA.

*Miltochrista sinica*, Moore, Ann. & Mag. Nat. Hist. ser. 4, vol. xx. p. 87 (1877).

One large male example.

## 40. CRAMBOMORPHA ENTELLA.

*Phalcena Tinea entella*, Cramer, Pap. Exot. iii. pl. 208. f. D (1782).

One specimen, rather worn.

## 41. KATHA IMMACULATA, sp. n.

Primaries buff-coloured, slightly sericeous, paler below than above; secondaries cream-coloured, margins and tips of veins tinted with ochreous: body above testaceous, front of head pale, below cream-coloured, the legs slightly darker. Expanse of wings 11 lines.

One specimen. This species would be well represented by Mr. Moore's figure of *Systrophu auriflua*; but the neuration is entirely different, the fourth and fifth subcostal branches of the primaries being emitted from a footstalk which starts from *below* the third branch as in *Katha*. The natural position of *K. immaculata* will be next to *K. intermixta*.

## 42. DEIOPETA PULCHELLA.

*Tinea pulchella*, Linnaeus, Syst. Nat. i. 2, p. 884 (1766).

Var. *Phalcena lotrix*, Cramer, Pap. Exot. ii. pl. 109. f. E (1779).

Six specimens, four of which belong to the variety *D. lotrix*.

## 43. NOLA INNOCUA, sp. n.

Primaries sordid white, base of costa whitish brown, limited below by a short black dash; a circular brown spot in the cell, bounded externally by a black zigzag line which runs to the inner margin at basal third; a brown costal patch, terminating below in a black spot at the end of the cell; a brownish discal belt immediately beyond the cell, bounded externally by a partially black angular zigzag line; submarginal area and marginal line brownish: secondaries silvery white, apex slightly brownish: body pearly white, palpi brown-speckled towards the tips. Under surface shining, primaries brownish, secondaries and body pearly white. Expanse of wings 6 lines.

One specimen.

Allied to *N. candida* from Japan.

## 44. NOLA SPRETA, sp. n.

Primaries above brown, crossed by three parallel irregularly undulated blackish lines, the first across the basal third, the second discal, the third submarginal; a marginal series of black dots: secondaries silvery white, semitransparent, with slender brownish marginal line and veins: thorax pale brown, metathorax and drums pearly; abdomen shining grey with a longitudinal dorsal black dash at the base. Primaries below pale brown; secondaries white, with brownish



costal border and veins; body below sordid white, legs partly brownish. Expanse of wings 6 lines.

One specimen, slightly rubbed.

More nearly allied to *N. strigulalis* than any other species known to me, but considerably smaller.

#### 45. *HYPSA ZEBRINA*.

*Hypsa zebrina*, Butler, P. Z. S. 1877, p. 815.

Seven specimens, completely establishing the constancy of the specific characters.

#### 46. *DAMALIS EGENS*.

*Hypsa egens*, Walker, Cat. Lep. Het. ii. p. 453 (1854).

Four specimens.

### NYCTEMERIDÆ.

#### 47. *PITASILA INCONSTANS*, sp. n.

Near to *P. bijunctella* of the Philippines. Primaries dark brown, the extreme base cream-coloured spotted with black; two oval white spots close to the base, one costal, the other (which is much larger) interno-median; an oblique series of four elongated spots before the middle, a broad oblique belt, partly divided into spots by the veins and forking externally from second median vein to costa, just beyond the middle; two large subapical spots, a dot on the outer margin, and part of the inner margin chalky white. In some examples all the markings on the external half are united at their extremities, in which case the specimen would be better described as having the apical half white, varied by five transverse curved brown streaks and spots, and with the apical border brown; but all sorts of intermediate forms exist between the two extremes. Secondaries snow-white with a dark-brown border, interrupted at apex and on the second median interspace by large white spots, which frequently break through and unite with the general area of the wing; fringe white. Thorax cream-coloured spotted with black; abdomen bluish white with black dorsal dots. Wings below darker than above; body below sordid white. Expanse of wings 2 inches to 2 inches 2 lines.

Six examples, exhibiting considerable variation of pattern.

Some time since Mr. Kirby called my attention to a paper on the *Nyctemeridæ* by Snellen van Vollenhoven, published in the 'Tijdschrift voor de Dierkunde' for 1863, pp. 35-51, in which a number of new species are described. As this paper appears to have been overlooked by every one, it may be useful to give a list of these new species, stating, so far as I have been able to identify them, what they are:—

\*1. *Leptosoma anthracinum*, De Haan, = *Secusio mundipicta*, Walk.

\*2. *Leptosoma assimile*, Voll. Close to *Secusio distincta*, Walk.

\*3. *Leptosoma herklotsii*, Voll. Close to *Nyctemera baulus*, Boisd.

- \*4. *Leptosoma quadriguttatum*, Voll. Said to be near the preceding species.
- 5. *Leptosoma mülleri*, Voll. Near to *Deilemera evergista*, Cram.
- \*6. *Leptosoma noviespunctatum*, Voll., = *Deilemera maculata*, Walk.
- 7. *Leptosoma luctuosum*, Voll. Near to *Deilemera mutabilis*, Walk.
- 8. *Leptosoma marginale*, Voll. Near to *Pitasila leucospilata*, Moore.
- 9. *Leptosoma leucostigma*, De Haan. Agrees with none of the *Nyctemeridæ* known to me; may be a *Craspedosis*.
- 10. *Leptosoma nubecula*, Voll. Close to the preceding species.
- \*11. *Leptosoma arcuatum*, Voll. Near to *Leptosoma latistriga*, Walk.
- 12. *Leptosoma pallens*, Voll. Probably near to *Zonosoma interlectum*, Walk.
- 13. *Leptosoma flavescens*, Voll., = *Secusio* sp. between *S. strigata* and *S. mundipicta*.
- \*14. *Leptosoma inconstans*, Voll. Near to *L. latistriga*, Walk.
- 15. *Leptosoma clathratum*, Voll. Near to *L. coleta*, Cram.
- 16. *Leptosoma ludekingii*, Voll. Near to *Tryptheromera plagi-fera*, Walk.
- 17. *Leptosoma machlotti*, Voll. Near to *Pitasila guttulosa*, Walk.
- 18. *Leptosoma scalarium*, De Haan. Near to *Pitasila inconstans*, Butl.

The species marked with an asterisk are in the British-Museum collection.

#### LIPARIDÆ.

##### 48. ARTAXA VARIANS.

*Artaxa varians*, Walker, Cat. Lep. Het. iv. p. 796 (1855).

Two pairs.

##### 49. PORTHETRIA BHASCARA.

*Lymantria bhascara*, Moore, Cat. Lep. E.I. Comp. ii. p. 345 (1858-59).

A male and two females in fair condition.

#### LIMACODIDÆ.

##### 50. APHENDALA CONSPERSA, sp. n.

Whity brown: primaries above minutely speckled with dark brown; a spot in the cell, a larger spot closing the cell, and a submarginal sinuated series of subconfluent dots black; apical margin blackish; primaries below pale fuliginous brown with whitish inner border: secondaries whitish with squamose brown costal border: body whitly brown. Expanse of wings 9 lines.

A pair, somewhat rubbed.

## NYCTEOLIDÆ.

51. *EARIAS*, sp.

Too much rubbed for identification; apparently nearest to *E. insulana*.

## PSYCHIDÆ.

52. *EUMETA* *PRYERI*.

*Eumeta pryeri*, Moore in litt.

A male specimen, much rubbed.

I believe that the description of this species will shortly appear in a Revision of the Eastern *Psychidæ* being prepared for publication by Mr. Moore.

## LEUCANIIDÆ.

53. *LEUCANIA* *LOREYI*.

*Leucanea loreyi*, Duponchel, Hist. Nat. Lép. France, iv. p. 81, pl. 105. fig. 7.

One specimen.

54. *LEUCANIA* *INFERENS*.

*Leucania inferens*, Walker, Cat. Lep. Het. ix. p. 105 (1856).

One rubbed specimen.

55. *LEUCANIA* *PERCUSSA*, sp. n.

Primaries above pale brown sprinkled with darker scales; veins whitish; a short longitudinal basal interno-median black line; a dot at the inferior angle of the cell and a marginal series black: secondaries shining pearly white; the veins, outer border, and fringe tinted with pale shining golden brown: thorax brown; abdomen sordid white. Primaries and body below pale shining brown; secondaries pearly white with the outer margin and fringe sordid, the costal border pale brown; all the wings with black marginal dots. Expanse of wings 1 inch 2 lines.

Two specimens, both somewhat rubbed.

56. *LEUCANIA* *INSULARIS*, sp. n.

Primaries above pale golden brown sprinkled with grey scales; a brownish streak just below the cell and extending into the lower radial interspace; a marginal subapical dash of the same colour; a dot in the cell, a second at the inferior angle of the cell, and a slightly arched discal series dark brown; a marginal series of black dots: secondaries semitransparent pearly white, the veins and outer border tinted with golden brown; six prominent marginal black dots: thorax golden brown, abdomen silvery whitish. Under surface shining white, the primaries and body tinted with golden brown, the wings with black marginal dots. Expanse of wings 1 inch 1 line.

One rubbed male example.

57. *SESAMIA* *TRANQUILLARIS*, sp. n.

Primaries above pale golden brown, with the base of the lower radial interspace and the outer border dusky, a slender blackish

marginal line, fringe sordid white; secondaries silky white; thorax pale golden brown; abdomen sordid silky white: under surface white, the primaries and body tinted with golden brown. Expanse of wings 1 inch.

One specimen.

Very much like *Leucaniu inferens* in colouring.

#### 58. ALETIA FORMOSANA, sp. n.

Primaries above pale reddish clay-colour mottled with grey, the apical third of costal border and a cuneiform subapical patch on the outer margin grey; reniform spot just visible as an indistinct B-shaped marking, the lower half filled with blackish scales; an angular discal series of seven black dots, the lower three forming an oblique line with the inner edge of the subapical cuneiform patch: secondaries opaline white with broad pale smoky-brown outer border, veins brownish: thorax pale clay-colour: abdomen pale brown, densely clothed with long white hair at the base. Under surface of the wings shining opaline white, the costal and apical areas tinted with brown and speckled with black: primaries with a nearly straight discal series of eight black dots on the veins, the first two confluent; a marginal series of very minute black dots: secondaries with a curved discal series of seven black dots on the veins, a marginal series of smaller black dots between the veins: body sordid, black-speckled.

Expanse of wings 1 inch 5 lines.

One specimen in fair condition.

Resembles some of the Moths associated by Walker with *Leucania extranea*; indeed it is possible that this genus may be represented in that series.

#### 59. NONAGRIA GRACILIS, sp. n.

Primaries pale golden brown, with slender darker marginal line and whitish fringe; secondaries silky white, tinted with golden brown; body pale golden brown, the thorax greyish, the abdomen whitish: primaries below paler than above, the internal area white; secondaries white, the veins slightly sordid; body below pale sandy brown. Expanse of wings 10 lines.

One male example.

#### GLETTULIDÆ?<sup>1</sup>

#### 60. CHASMINA GLABRA.

*Chasmina glabra*, Walker, Cat. Lep. Het. Suppl. ii. p. 636 (1865).

Two females, undistinguishable from a female in the Museum from New Caledonia.

#### XYLOPHASIIDÆ.

#### 61. SPODOPTERA ERICA, sp. n.

Primaries above sericeous fuliginous brown, markings very indistinct; a small blackish-edged white discoidal stigma; four or five

<sup>1</sup> Walker places the genus *Chasmina* in this family with hesitation; in my opinion it is more nearly allied to the Acontiidæ.

white costal dots beyond the middle; a discal transverse slightly irregular series of dark-edged pale lunules followed by a submarginal series of similarly coloured dots; fringe with a white basal line; secondaries pearly white; a dark-brown marginal line; costal and external borders brown, diffused: body fuliginous brown. Primaries below pale shining fuliginous brown, with subconfluent marginal black dots, fringe as above; secondaries with the borders paler than above; body paler than above, the legs whitish. Expanse of wings, ♂ 1 inch one line, ♀ 1 inch 3 lines.

A pair in good condition and three rubbed examples.

#### 62. LAPHYGMA INFECTA.

*Prodenia infecta*, Walker, Cat. Lep. Het. ix. p. 196 (1856).

A pair.

#### 63. PRODENIA RETINA.

*Neuria retina*, Herrich-Schäffer, Eur. Schmett. ii. p. 292, pl. 29, fig. 145.

Six worn specimens.

#### 64. PRODENIA GLAUCISTRIGA.

*Prodenia glaucistriga*, Walker, Cat. Lep. Het. ix. p. 197 (1856).

Four worn specimens.

### NOCTUIDÆ.

#### 65. PERIGEA DOLOROSA.

*Mamestra dolorosa*, Walker, Cat. Lep. Het. Suppl. ii. p. 667 (1865).

One male.

#### 66. PERIGEA ILLECTA.

*Perigea illecta*, Walker, Cat. Lep. Het. Suppl. ii. p. 684 (1865).

One female; probably that sex of the preceding species, from which it differs very little.

### HELIOTHIDÆ.

#### 67. HELIOTHIS ARMIGERA.

*Noctua armigera*, Hübner, Noct. pl. 79, fig. 370 (1805-24).

Three specimens.

#### 68. HELIOTHIS SUCCINEA.

*Heliothis succinea*, Moore in litt.

Two specimens, varying considerably in colour.

### ACONTIIDÆ.

#### 69. XANTHODES IMPELLENS.

*Xanthodes impellens*, Walker, Cat. Lep. Het. xv. p. 1752 (1858).

One faded example.

## 70. ACONTIA MERIDIONALIS.

*Acontia meridionalis*, Walker, Cat. Lep. Het. Suppl. iii. p. 785 (1865).

One damaged specimen.

## 71. ACONTIA MACULOSA.

*Acontia maculosa*, Walker, Cat. Lep. Het. xii. p. 795 (1857).

One good specimen.

## ANTHOPHILIDÆ.

## 72. MICRA DEROGATA.

*Micra derogata*, Walker, Cat. Lep. Het. xii. p. 825 (1857).

One good specimen.

73. ACANTHOLIPES<sup>1</sup> INCONSPICUA, sp. n.

Nearest to *A. nigrisigna* and *A. affinis*. Sericeous, dark grey: primaries with an oblique black discoidal stigma, immediately followed by a broad sigmoidal blackish belt from the centre of the inner margin to the subcostal vein; external area limited internally by an oblique blackish stripe enclosing an ochreous line, and running from inner margin almost to apex: secondaries with the disk blackish, crossed from close to the external angle to the radial vein by an oblique narrow ochreous stripe. Under surface much paler than above; the wings very pale grey, speckled with darker scales, crossed beyond the middle by two parallel darker stripes (the outer one of primaries confluent with the external border), and a broad dark grey external border: palpi blackish above, white below. Expanse of wings 1 inch.

Two specimens, somewhat rubbed.

## PLUSIIDÆ.

## 74. PLUSIA VERTICILLATA.

*Plusia verticillata*, Guénée, Noct. ii. p. 344 (1852).

One specimen.

## 75. PLUSIA OCHREATA.

*Plusia ochreata*, Walker, Cat. Lep. Het. Suppl. iii. p. 839 (1865).

One specimen.

## GONOPTERIDÆ.

## 76. COSMOPHILA INDICA.

*Cosmophila indica*, Guénée, Noct. ii. p. 396 (1852).

Three specimens.

<sup>1</sup> This species agrees with *Doclea*, Walk., in general pattern and coloration. Mr. Moore assures me that that genus is structurally identical with *Microphysa*=*Acantholipes*, Lederer.

## HYPOGRAMMIDÆ.

77. *GADIRTHA IMPINGENS*?

*Gadirtha impingens*, Walker, Cat. Lep. Het. xiii. p. 1103 (1857).

One specimen, apparently referable to this species, but larger than the type, and too much rubbed for certain identification.

78. *ERCHEIA CHARON*, sp. n.

Near to *E. cyllaria*<sup>1</sup>, but the primaries above with no distinct oblique costal whitish dash, the discal parallel black lines forming a wide semicircular curve; a submarginal irregularly undulated whitish line: secondaries with the central white spot large, the discal spot obsolete, the apical spot large and oblong. Secondaries below with no distinct black patch on the anal area, but the discal belt continuous; two distinct zigzag submarginal pale brown lines. Expanse of wings 2 inches 5 lines.

One female example.

I have compared this with a specimen of *E. cyllaria* in Mr. Moore's collection, and find it very distinct; it is larger than that specimen.

## CATEPHIIDÆ.

79. *ERCHEIA FUSIFERA*.

*Achæa fusifera*, Walker, Cat. Lep. Het. xiv. p. 1398 (1857).

One example.

The following species, placed in *Achæa* by Walker, must be referred to *Ercheia*.—*A. cyllota*, *A. cyllaria*, *A. fusifera*, *A. signivitta*, and *A. polychroma*; *Catephia dubia* may also be placed in this genus.

## TOXOCAMPIDÆ.

80. *PLECOPTERA DOLOSA*, sp. n.

Greyish brown, more cinereous in the female than in the male: primaries above partly crossed near the base by an abbreviated zigzag dark-brown litura; a black dot near the inner margin; an internally white-edged black stripe across the basal third; "reniform" whitish, with grey centre and brown margin, followed in the male by a notched dark-brown spot; discal line extremely irregular, having two deep angular sinuses; submarginal line indistinct, zigzag, bounded internally in the male by a series of trigonal blackish spots, which become gradually more defined towards the costal margin; in the same sex there is an indistinct marginal series of greyish spots: secondaries crossed in the middle by an oblique, slightly sinuous, whitish-bordered, blackish stripe; external area dark brown, crossed by an abbreviated whitish zigzag line, and interrupted by a marginal series of pale spots. Under surface altogether paler; wings with black discocellular spots, discal line, and submarginal belt. Expanse of wings 1 inch 3-4 lines.

One male and three females.

## 81. ANOPHIA ACRONYCTOIDES.

*Anophia acronyctoides*, Guénée, Noct. iii. p. 47 (1852).

Five specimens.

## 82. STEIRIA, sp.

One specimen, too much worn for satisfactory identification.

## OPHIDERIDÆ.

## 83. OPHIDERES FULLONICA.

*Phalæna-Noctua fullonica*, Linnæus, Syst. Nat. p. 812 (1766).

Two specimens.

## OPHIUSIDÆ.

## 84. LAGOPTERA DOTATA.

*Noctua dotata*, Fabricius, Ent. Syst. iii. 2, p. 55 (1793).

One specimen.

## 85. OPHIODES TRIPHÆNOIDES.

*Ophiodes triphænoides*, Walker, Cat. Lep. Het. xiv. p. 1358 (1857).

Two specimens.

## 86. OPHIODES CUPREA.

*Ophiodes cuprea*, Moore, P. Z. S. 1867, p. 74.

Two specimens.

## 87. ACHÆA MELICERTE.

*Phalæna-Noctua melicerte*, Drury, Ill. Ex. Ent. i. p. 46, pl. 23.  
fig. 1.

Three specimens.

## 88. OPHIUSA ARCUATA.

*Ophiusa arcuata*, Moore, P. Z. S. 1877, p. 609.

One specimen.

## 89. OPHIUSA SIMILLIMA.

*Ophiusa simillima*, Guénée, Noct. iii. p. 266 (1852).

One perfect and two broken specimens.

## 90. GRAMMODES AMMONIA.

*Phalæna ammonia*, Cramer, Pap. Exot. iii. pl. 250. f. D (1782).

Three specimens.

## 91. GRAMMODES MYGDON.

*Phalæna mygdon*, Cramer, Pap. Exot. ii. pl. 156. f. G (1779).

One good and two broken examples.



## EUCLIDIIDÆ.

## 92. TRIGONODES HYPPASIA.

*Phalœna-Noctua hyppasia*, Cramer, Pap. Exot. iii. pl. 250. f. E (1782).

Four specimens, more or less worn.

## 93. TRIGONODES INACUTA.

*Trigonodes inacuta*, Guénée, Noct. iii. p. 284 (1852).

One good and one much rubbed example.

## REMIGIIDÆ.

## 94. REMIGIA ARCHESIA.

*Phalœna-Noctua archesia*, Cramer, Pap. Exot. iii. pl. 273. figs. F, G (1782).

*Remigia gregalis*, Guénée, Noct. iii. p. 320 (1852).

Nine specimens.

This has been confounded with the succeeding species, from which it appears to me to be distinct.

## 95. REMIGIA VIRBIA.

*Phalœna-Noctua virbia*, Cramer, Pap. Exot. iii. pl. 273. fig. H (1782).

Four specimens.

## 96. REMIGIA ? OPTATIVA.

*Remigia optativa*, Walker, Cat. Lep. Het. xiv. p. 1510 (1857).

Four specimens. The species appears to me to be referable to the genus *Polydesma* rather than *Remigia*.

## 97. REMIGIA FRUGALIS.

*Noctua frugalis*, Fabricius, Ent. Syst. iii. 2, p. 138 (1793).

Two examples.

## THERMESIIDÆ.

## 98. THERMESIA RETICULATA.

*Thermesia? reticulata*, Walker, Cat. Lep. Het. Suppl. iii. p. 1062 (1865).

*Homodes? thermesioides*, Snellen, Tijd. voor Ent. 1876, p. 28, pl. 2. fig. 15.

One specimen.

This is one of the numerous species described by Walker which Herr Snellen has renamed. It seems a great pity that any entomologist, by practically ignoring the labours of his predecessors, should continue every year to add to the already over-burdened synonymy of the Lepidoptera. Although many of the species described by Walker are referred to genera, families, and even tribes to which they have no affinity, so many more are readily recognizable from his descriptions as to leave no excuse for any one who carelessly or recklessly redescribes them.

## HYPENIDÆ.

99. *HYPENA SUBCYANEA*, sp. n.

Greyish brown: primaries above brilliantly shot with pale lilacine blue which towards the base becomes pale silvery blue, crossed near the base by two or three blackish dots; an oblique black line beyond the middle, slightly crinkled towards the costa, where it crosses an oblique apical white dash; a discal series of black dots or abbreviated dashes; fringe dark brown: secondaries with a slender whitish marginal line, the margin itself black, fringe whitish: thorax shot with lilac. Under surface altogether paler; the secondaries whitish, with brownish costal border: body below sordid white. Expanse of wings 1 inch.

One specimen.

100. *HYPENA SUBVIOLACEA*, sp. n.

Greyish brown: primaries above shot with lilac, crossed near the base by several blackish dots; a blackish spot at the end of the cell; an externally white-edged crenulated black discal line, much less oblique than in the preceding species and subangulated; a discal series of black dots; a marginal series of white-edged semi-circular black dots; fringe broad, clay-brown, traversed by two parallel black lines: secondaries with a slender blackish marginal line; fringe grey, traversed by a darker line: thorax above shot with lilacine. Wings below as in the preceding species. Expanse of wings 1 inch.

Three more or less worn specimens.

## HERMINIIDÆ.

101. *HYDRILLODES INDISTINCTA*, sp. n.

Primaries above fuliginous brown, crossed by two widely separated, very indistinct, angulated, subparallel, slender black lines, between which is a well-marked black discoidal stigma; an indistinct abbreviated zigzag subapical black line: secondaries sordid white, with greyish diffused outer border: thorax fuliginous brown; abdomen greyish brown. Primaries below sericeous, pale grey, with pale-brown costal and external borders; secondaries whitish, with whitish-brown costal and external borders, a discocellular dot and sub-marginals tripe greyish brown: body below whitish-brown; legs grey. Expanse of wings 11 lines.

One specimen.

102. *AMBLYGOES EVULSALIS*.

*Apphadana evulsalis*, Walker, Cat. Lep. Het. Suppl. iv. p. 1213 (1865).

One specimen.

## PYRALIDÆ.

103. *PYRALIS TENUIS*, sp. n.

Whitish-brown, sericeous. Primaries with the costal margin plum-  
PROC. ZOOL. SOC.—1880, No. XLV.

coloured at base, remainder of costal margin cupreous; two transverse widely separated grey lines dividing the wing into three nearly equal parts, the inner line slightly angulated; fringe traversed by a grey line and tipped with grey: secondaries crossed near the middle by two angulated, arched, subparallel grey lines; fringe traversed by a very pale grey line. Wings below golden or sandy yellow, glossy, with lines as above, the secondaries paler excepting at the outer border; body below bright sandy yellow. Expanse of wings 11 lines.

One rather ragged specimen.

This species seems to be allied to the "*Asopia decoloralis*" of Lederer (Wien. ent. Monatschr. vii. pl. 6. fig. 10).

#### 104. PYRALIS, sp.

Two rubbed examples, too much worn for identification; the species seems allied to *P. farinalis*.

#### 105. DOTHTHA THERMUSALIS.

*Pyralis? thermusalis*, Walker, Cat. Lep. Het. xvii. p. 311 (1859).

Two examples.

It is doubtful whether the genus *Doththa* can be distinguished from *Endotricha* (Asopiidæ).

### ENNYCHIDÆ.

#### 106. PYRAUSTA ABSISTALIS.

*Pyrausta absistalis*, Walker, Cat. Lep. Het. xvii. p. 311 (1859).

One example with rather larger and darker spots than in the type, in which respect it approaches "*Asopia lydielis*" of Walker, from Moreton Bay, Australia, which is a *Pyrausta* closely allied to *P. absistalis*.

### ASOPIIDÆ.

#### 107. SAMEA DIVES, sp. n.

Bright ochre-yellow. Wings above mottled and striped towards the base with burnt-sienna; a very irregular waved and crenulated slender black discal line; a rather broad sericeous plum-coloured external border, sinuated and black-edged internally; fringe short, dark brown: primaries with an irregularly notched black-edged plum-coloured and burnt-sienna reniform spot: body spotted at the sides with burnt-sienna, and with whitish hinder margins to the abdominal segments. Wings below altogether paler than above, the markings indistinct; body below creamy white. Expanse of wings 10 lines.

One specimen: it is brighter in colour than any species known to me.

#### 108. ASOPIA RUFIPICTA, sp. n.

Bright straw-yellow, with the lines and spots arranged almost exactly as in *A. vulgaris* of Guénée, but rose-coloured instead of

black; outer border rather broadly tinted with pale rose-colour; costal margin of primaries and front of thorax reddish; head, back of thorax, and abdomen whitish: under surface creamy white, the wings tinted with straw-yellow, markings very indistinct. Expanse of wings 9 lines.

One specimen.

This species somewhat reminds one of the "*Botys egenalis*" of Lederer.

#### 109. ASOPIA HIPPONALIS.

*Asopia hipponalis*, Walker, Cat. Lep. Het. xvii. p. 374 (1859).

One specimen of this Australian species.

#### 110. ASOPIA? IOLEALIS.

*Botys iolealis*, Walker, Cat. Lep. Het. xviii. p. 666 (1859).

One specimen.

#### 111. HYMENIA FASCIALIS.

*Phalæna-Pyralis fascialis*, Cramer, Pap. Exot. iv. pl. 398. fig. O (1782).

Seven specimens.

### STENIIDÆ.

#### 112. DIASEMIA GEOMETRALIS.

*Lepyrodes geometralis*, Guénée, Delt. et Pyral. p. 278 (1854).

Two specimens. Notwithstanding the arrangement of their spots, the form of their wings seems rather that of *Diasemia* than *Lepyrodes*.

#### 113. STENIA, sp.

Three specimens, all far too much rubbed for description.

The following species may be referred to *Stenia*—*Cataclysta?* *elutalis* of Walker, from Ceylon, and *C. fraterna*, Butl., from Natal, both of which are nearly allied to *C. ornatalis* of Europe.

#### 114. STENIA ORNATALIS.

*Asopia ornatalis*, Duponchel, Léop. viii. 2, p. 207, pl. 223. fig. 8.

One example.

### HYDROCAMPIDÆ.

#### 115. CATACLYSTA NYMPHA, sp. n.

Wings above opaline, semitransparent white: primaries with a large ovoid ochreous patch occupying the lower half of the basal area and enclosing a longitudinal stripe of the ground-colour, which is edged below with black; external two fifths bright ochreous crossed by two grey-edged slightly curved stripes of the ground-colour; basal fifth of costal margin dark brown; a large triangular costal brown patch at the end of the cell, crossed by opaline disco-cellular veinlets; two dark-brown dashes at apex: secondaries with a

blackish-edged ochreous dash across the median branches, bounded below by a vividly opaline stripe; an ochreous nebula on the external area, and a little congregation of jet-black spots and dots spangled with metallic green upon the outer border: body creamy yellowish, anal tuft black. Under surface creamy white. Expanse of wings 10 lines.

One specimen. We have it also from Borneo and Sumatra. It is most nearly allied to *C. seapunctalis* of Moore and *C. toluinalis* of Walker (erroneously referred to *Leucochroma*).

#### 116. CYMORIZA MINIMA, sp. n.

Grey: primaries with a series of equidistant black-edged white dots on the costal margin, an angulated white line across the basal third, and a second near the outer margin; a whitish-bordered black discocellular lunule; fringe yellowish, tipped with black and snow-white: secondaries with a black spot in the cell, a white-bordered, abbreviated, curved subanal discal line; fringe yellowish at base, traversed by a black line and tipped with snow-white. Primaries below brown, with no subbasal line, otherwise as above: secondaries white mottled with dark brown, with white-edged irregular discal stripe and a discoidal spot black: pectus white, venter brown. Expanse of wings 6 lines.

One specimen.

#### SPILOMELIDÆ.

#### 117. ZEBRONIA ABDICALIS.

*Zebronia abdicalis*, Walker, Cat. Lep. Het. xvii. p. 480 (1859).

One example in good condition, and one much broken. "*Conchylodes æriferalis*" of Moore appears to me to be referable to this species.

#### 118. GLYPHODES BIVITRALIS.

*Glyphodes bivitalis*, Guénée, Delt. et Pyral. p. 293 (1854).

One specimen.

#### 119. GLYPHODES MALAYANA, sp. n.

Nearly allied to *G. itysalis*. Primaries fuliginous brown, slightly cupreous towards the base; the base of inner margin, an angular subbasal line, an oblique streak tapering to a point below the origin of the first median branch, a small triangular spot below the latter on the inner margin, an externally angulated transverse abbreviated band beyond the cell from costa to first median branch, and a (rather more bluish) litura on the discocellulars semitransparent white with opaline reflections; a scarcely perceptible crenulated transverse discal silver-white line, immediately followed by a lilacine band, which alone separates it from the external border: secondaries opaline transparent white; the discocellulars, an oblique streak near the base of the first median branch, and an internal streak black; a black-bordered silvery line, followed by a lilacine band and broad brown border as in the primaries; abdominal area opaque cinereous

creamy white: body white, abdomen with a series of blackish spots on each side; anal tuft of male often tipped with black. Under surface altogether paler, the basal markings obsolete. Expanse of wings 1 inch 1 line.

Eleven specimens, all more or less rubbed. A local form of the same species, only differing in its slightly superior size and the more cupreous brown colouring of its wings, occurs at Sarawak, and was doubtless supposed by Walker to be a variety either of *G. itysalis* or *G. zelimalis*<sup>1</sup>.

120. PHAKELLURA INDICA.

*Eudyothis indica*, Doubleday, Zool. ix. p. 3070 (1851); Trans. Ent. Soc. n. s. vol. i. pl. 12. fig. 5 (1850-51).

Five examples.

121. MARGARONIA POMONALIS.

*Margarodes pomonalis*, Guénée, Delt. et Pyral. p. 309 (1854).

Two specimens.

122. MARUCA AQUATILIS.

*Hydrocampa aquatilis*, Boisduval in Guérin's Ic. Règne Anim. Ins. pl. 90. fig. 9.

Three specimens.

BOTYDIDÆ.

123. BOTYS DAMOALIS.

*Botys damoalis*, Walker, Cat. Lep. Het. xviii. p. 656 (1859).

One example.

124. BOTYS COCLESALIS.

*Botys coclesalis*, Walker, Cat. Lep. Het. xviii. p. 701 (1859).

Three specimens of this Bornean species.

125. BOTYS TROPICALIS.

*Botys tropicalis*, Walker, Cat. Lep. Het. xviii. p. 670 (1859).

One specimen.

126. BOTYS STULTALIS.

*Botys stultalis*, Walker, Cat. Lep. Het. xviii. p. 669 (1859).

Seven specimens.

<sup>1</sup> Another Bornean species overlooked by Walker may be called *G. lacteata*. It is white, the wings opaline, with cream-coloured outer borders preceded by a broad cupreous-brown band enclosing a lilac stripe between two cream-coloured lines. Primaries crossed by three convergent brown stripes—the first running from base of costa to the second stripe and then downwards with a short elbow to the inner margin, the second from basal fifth of costa to apical third of inner margin, where it joins the third (between the first and second is a slender brown line); the third broader, and enclosing a lilacine discocellular litura: body silvery white, above with a brown dorsal stripe on the collar and abdomen, and another on each shoulder. Expanse of wings 1 inch 1 line. Sarawak, Coll. B. M.

127. *BOTYS THYASALIS*.

*Botys thyasalis*, Walker, Cat. Lep. Het. xviii. p. 734 (1859).

One specimen.

128. *BOTYS PRUINALIS*?

*Botys pruinalis*, Lederer, Wien. ent. Monatschr. vii. pl. ix. fig. 6.

One specimen, of apparently this species.

## TATOBOTYS, gen. nov.

Wings ovoid, elongated, with rounded apex. Palpi small and short; antennæ thick, nearly as long as the primaries. Body extremely long, with small furcate terminal tuft. Legs very long; tibiæ of second pair with one long and two short terminal spines, of third pair with two central and two terminal spines, the inner one in each case being much longer than the outer, but both pairs tolerably long. Type *T. argillacea*.

129. *TATOBOTYS ARGILLACEA*, sp. n.

Dark clay-coloured, clouded with cupreous brown. Primaries with very irregular denticulated blackish subbasal and discal lines, a black dot in the cell and a double spot at the end, fringe dull black; secondaries with a small black annulus at the end of the cell and an irregular denticulated discal line, a slender black marginal line; fringe blackish, with a pale basal line; costa whitish. Wings below paler; body below whitish. Expanse of wings 10 lines.

One example. It is also in Mr. Moore's collection.

130. *GODARA COMALIS*.

*Godara comalis*, Walker, Cat. Lep. Het. xix. p. 809 (1859).

Three more or less rubbed specimens.

## ENNOMIDÆ.

131. *SCARDAMIA METALLARIA*.

*Scardamia metallaria*, Guénée, Phal. i. p. 89 (1857).

One example.

## BOARMIDÆ.

132. *BOARMIA INCONCLUSA*.

♀. *Boarmia inconclusa*, Walker, Cat. Lep. Het. xxi. p. 382 (1860).

One rather shattered female.

133. *HYPOCHROMA RUGINARIA*.

*Hypochroma ruginaria*, Guénée, Phal. i. p. 278 (1857).

Two specimens.

## PALYADIDÆ.

## 134. EUMELEA AURELIATA.

*Eumelea aureliata*, Guénée, Phal. i. p. 394, pl. 22. fig. 6 (1857).  
One example.

## ACIDALIIDÆ.

## 135. ACIDALIA NESCIARIA.

*Acidalia nesciaria*, Walker, Cat. Lep. Het. xxii. p. 750 (1861).  
One specimen.

## 136. ACIDALIA PERLINEATA.

*Acidalia perlineata*, Walker, Cat. Lep. Het. xxiii. p. 775 (1861).  
*Acidalia eulomata*, Snellen, Tijds. voor Ent. 1876, p. 42, pl. 3.  
fig. 21.

Five specimens.

On the same plate as that on which "*A. eulomata*" is figured is a representation of a splendid little member of the family Adelidæ, described by Herr Snellen as a *Simæthis*! (and referred to the family Tineidæ!!) under the name of "*Simæthis pronubana*." Lord Walsingham has called my attention to the fact that this supposed new species is nothing more nor less than *Badera prodigilla* of Walker, Lep. Het. Suppl. v. p. 1820 (1866), referred by the latter author to its proper family and well described as follows:—" *Cuprea, micans; caput viride, subtus pallide ochraceum; alæ anticæ strigis tribus basalibus viridibus, secunda arcuata, dimidio exteriori purpureo; posticæ vitta lineaque abbreviata pallide ochraceis.*" The locality of the type is in both cases Java.

Whether the description in the Tijdschrift is more complete than Walker's I cannot say, since the figure is unmistakable, and the description occupies two entire pages; but it seems strange that the long antennæ of the species never suggested the family Adelidæ to Herr Snellen, and that in penning his minute description no thought of Walker's concise diagnosis ever flashed across his brain.

## 137. ACIDALIA REPLETARIA?

*Acidalia repletaria*, Walker, Cat. Lep. Het. xxiii. p. 778 (1861).  
One specimen apparently referable to this Australian species.

## 138. TIMANDRA AVENTIARIA.

*Timandra aventiaria*, Guénée, Phal. ii. p. 3 (1857).  
A specimen of this Australian species.

## 139. ZANCLOPTERYX FRAGILIS, sp. n.

Small for the genus. Snow-white: wings semitransparent, with minute black marginal dots connected by a very slender crenulate dusky marginal line; a continuous irregularly sinuated discal testaceous line: primaries with a second testaceous line across the



basal fourth; a well-marked black discocellular spot: secondaries with a testaceous discocellular spot. Expanse of wings  $8\frac{1}{2}$  lines.

One specimen.

#### MICRONIIDÆ.

##### 140. MICRONIA GANNATA.

♂. *Micronia gannata*, Guénée, Phal. ii. p. 26 (1857).

♀. *Micronia aculeata*, Guénée, l. c. pl. 13. fig. 8 (1857).

Five examples, of which four are males having the dark under surface of *M. gannata*; the fifth (which is much broken) is a female, and has the under surface white, as in typical *M. aculeata*. Although it is true that there are males in which the under surface is white, I have seen numerous gradations from this colour to the dusky brown tint of the type, and I have never yet seen a female with the under surface dark. I therefore agree with Walker in his statement that *M. gannata* "appears to be the male of *M. aculeata*." Why this author described a second male as *M. aculeata*, with the wings below "*plus minusve cinereæ*," I cannot understand, since the only reason for separating the two forms is that the wings below are not "*plus minusve cinereæ*," but *albæ*.

#### LARENTIIDÆ.

##### 141. EUPITHECIA, sp.

One specimen too much rubbed for description; it seems to come nearest to *E. implicata*.

##### 142. EUPITHECIA TRISTRIGOSA, sp. n.

Brown; wings crossed near the base by an angular black stripe, and close to the base by a greyish band with undulated margins, followed by a central greyish stripe; an angulated discal black stripe followed by two parallel grey lines; a slightly undulated submarginal black stripe; under surface redder than the upper surface, the markings less distinct. Expanse of wings 10 lines.

Two specimens. The name which I have given it notes the three black stripes across the wings, a peculiarity which distinguishes it from all species which I have seen. The primaries are unfortunately rather badly rubbed; but traces of the submarginal band are distinctly visible upon the rubbed portion of these wings.

#### PHYCIDÆ.

##### 143. TRACHONITIS PUNCTIGERA, sp. n.

Primaries above olivaceous, base and internal border brown; two or three ill-defined oblique brownish costal lines; discoidal stigma lunate, silvery white; apical third plum-coloured, angulated internally so as just to enclose the discoidal stigma, beyond which it emits a diffused reddish streak into the cell; a subapical reddish-bordered olivaceous spot; fringe pale brown, with a subbasal dusky line: secondaries sericeous greyish brown with cupreous reflections; fringe whitish, traversed by a grey line: body above greyish brown.

Under surface greyish brown, with cupreous reflections; wings with whitish fringe, traversed by a grey line and with a yellowish basal line. Expanse of wings 9 lines.

Three examples.

144. *NEPHOPTERYX HYEMALIS*, sp. n.

Primaries shining slaty black; secondaries pearly white, transparent; costal border and marginal line brownish; fringe traversed by a grey line; thorax slaty black; abdomen brown. Primaries, costal border of secondaries, and body below sericeous grey. Expanse of wings 11 lines.

One slightly broken example. It is most nearly allied to *N. semi-nivella*.

145. *PEMPELIA ZINCKENELLA*.

*Phycis zinckenella*, Treitschke, Schmett. Eur. ix. 1, 201 (1832).

*Assara albicostalis*, Walker, Cat. Lep. Het. xxvii. p. 80 (1863).

*Modiana scitivittalis*, Walker, l. c. p. 83 (1863).

*Alata anticalis*, Walker, l. c. p. 108 (1863).

*Crambus sabulinus*, Butler, Ann. & Mag. Nat. Hist. ser. 5, vol. iv. p. 455 (1879).

One specimen. This European species seems to come from all parts of the world: the specimen upon which Walker founded his genus *Assara* is from Borneo, that on which he founded his genus *Modiana* from Australia, those upon which he founded his genus *Alata* from St. Jago and Sierra Leone; and the example which (misled by its long palpi) I described as a *Crambus* was from Japan. It now comes from South Formosa; and we have an example in the Museum collection from Espirito Santo in Brazil.

*CERATAMMA*, gen. nov.

Allied to *Pempelia*, but the basal joint of the antennæ thicker; the second joint large, and covered on both upper and under surfaces by a flattened tuft of hair-like scales; frons terminating in a conical process projecting downwards; palpi about as long as in *P. zinckenella*, but projecting obliquely downwards; neuration as in *Pempelia*.

Type *C. hobsoni*.

146. *CERATAMMA HOBSONI*, sp. n.

Primaries above greyish brown; basal fourth dark brown, limited externally by an orange oblique stripe, margined internally with black and externally with pearly whitish; secondaries pearly white, costal border, outer margin, and a line on the fringe grey; body sericeous greyish brown. Under surface sericeous greyish brown, the secondaries becoming white towards the abdominal margin. Expanse of wings  $8\frac{1}{2}$  lines.

Four examples, all more or less rubbed, but showing the markings.

## CRAMBIDÆ.

## 147. SCIRPOPHAGA PRÆLATA.

*Tinea prælata*, Scopoli, Entom. Carn. 198 (1763).

One pair.

## 148. SCIRPOPHAGA DEGENERELLA.

*Rupela? degenerella*, Walker, Cat. Lep. Het. xxviii. p. 524 (1863).

One pair.

## 149. JARTHEZA CHRYSOGRAPHELLA.

*Chilo chrysographellus*, Kollar, Hügel's Kaschmir, iv. p. 494 (1848).

One example.

## 150. JARTHEZA SIMPLEX, sp. n.

Form of the preceding species, but the primaries of the male uniformly greyish brown, minutely sprinkled with darker scales, a marginal series of black dots, fringe blackish; of the female testaceous with black marginal dots and pale testaceous fringe: secondaries silvery white, slightly greyish in the male: body corresponding in colour with the wings. Under surface white, the wings suffused with brown in the male and with testaceous in the female towards the costal margin. Expanse of wings, ♂ 11 lines, ♀ 13 lines.

A pair.

## 151. APURIMA GRATIOSELLA, Walker (in litt.?).

Very near to *A. bipunctifera* (*Tipanæa bipunctifera*, Walk.), but the primaries ochraceous, with deep-ochreous fringes and a very small black dash or dot at the inferior angle of the discoidal cell; secondaries silvery white, tinted with cream-colour and with ochraceous fringe; body white. Expanse of wings 1 inch 3 lines.

Five specimens, and one variety with no trace of the black dot. It also comes from Sarawak, Borneo.

## 152. CIRROCHRISTA BRIZOALIS.

*Margaronia brizoalis*, Walker, Cat. Lep. Het. xix. p. 976 (1859).

*Cirrochrista ætherialis*, Lederer, Wien. ent. Monatschr. vii. Taf. 17. fig. 9 (1864).

One fine specimen. The type, which is a bad specimen, was from Hong-Kong; the examples quoted by Walker as coming from Borneo and Moreton Bay appear to be distinct.

## HYPONOMEUTIDÆ.

## 153. ATTEVA NIVEIGUTTA.

*Atteva niveigutta*, Walker, Cat. Lep. Het. ii. p. 526 (1854).

One example. The type was from Silhet.

This species is distinct from, although allied to, *Corinea niviguttella*, *C. impariguttata*, and *C. emissella*.

154. *AZINIS HILARELLA*.

*Azinis hilarella*, Walker, Cat. Lep. Het. xxviii. p. 542 (1863).

Three fine specimens. The genus is easily distinguished from *Hyponomeuta* by the broadly expanded abdominal border of the secondaries; *H. circumdatellus* and *H. assamensis* must be referred to *Azinis*.

## TINEIDÆ.

155. *TINEA TAPETZELLA*.

*Tinea tapetzella*, Linnæus, Syst. Nat. x. p. 536 (1766).

One specimen.

4. Description of a new Species of *Reithrodon*, with Remarks on the other Species of the Genus. By OLDFIELD THOMAS, F.Z.S., British Museum.

[Received December 6, 1880.]

The subject of the present description was obtained by the late Mr. D. Dyson in Venezuela, and is now in the British Museum. It belongs to a well marked and most interesting species, which I propose to name after my friend Mr. E. R. Alston, whose work on Rodents generally, and especially on those of America, is well known to all interested in the subject.

*REITHRODON ALSTONI*, sp. n.

Form rather slender and rat-like, not so stout as in the other species. Ears rather short; laid forward they do not reach to the

Fig. 1.



Right hind foot of *Reithrodon alstoni*.

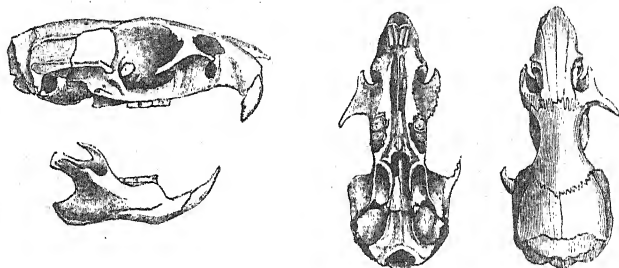
eye. Limbs short, fifth toe of both fore and hind feet barely reaching to the end of the fourth metacarpal or metatarsal, as in *R. typicus* and *R. cuniculoides*, thus differing from *R. chinchilloides*

in which they reach to the end of the first phalanx of the fourth digit<sup>1</sup>. Tail about equal in length to the body without the head.

Quality and coloration of the fur almost exactly as in pale specimens of *Sigmodon hispidus*, Say and Ord, to which this species bears a most remarkable resemblance. Fur of the back of two kinds: the woolly underfur dark slaty blue; and of the longer hairs some are black for their whole length, and others have a long yellowish-white tip. Belly white, with a slaty tinge at the roots of the hairs; sides of the muzzle yellowish; whiskers brown.

The anterior edge of the root of the zygoma is rather deeply emarginate in front, though not so much so as in *R. cuniculoides*. The palate agrees more with that of *R. chinchilloides*, ending just behind the molars, and being less ridged and excavated than in *R. cuniculoides*. Posterior nares not narrowed by the approximation of the pterygoids. Incisive foramina short, ending in front of the first molar. Pterygoid fossæ deep. Frontal bones with a strong concavity just behind the orbital constriction, as shown in the drawing (see fig. 2).

Fig. 2.



Skull of *Reithrodon alstoni*.

The teeth are very different from those of any of the other species of the genus, being much shorter and broader, so that the whole length of the molar series is contained twice in the distance between the incisors and the first upper molar, while in none of the others is it contained more than once and a half; and the second upper molar is distinctly broader than long, while in the other species the opposite obtains. The molars of the type specimen are too much worn down for their pattern to be described; but the woodcut (fig. 2) shows their general shape. The upper incisors have a deep and distinct groove down the centre of their front surface, a groove much more strongly marked than in any of the other species.

<sup>1</sup> This character, which Waterhouse appears to have overlooked, seems to carry out still further the parallelism between *Sigmodon* and *Oryzomys* on the one hand and the two "subgenera" of *Reithrodon* on the other, which Dr. Coues drew attention to when subdividing this genus (see *infra*, p. 694).

Measurements of the type, an adult male in spirit :—

	in.
Length of head and body .....	5.3
„ tail .....	3.6
„ hind foot without claws .....	1.0
„ head .....	1.65
„ nose to eye .....	0.65
„ nose to ear-orifice .....	1.30
„ ear-conch 0.65, breadth .....	0.62
„ forearm and hand .....	1.28
„ tibia from knee to sole .....	1.3
„ skull .....	1.36

One of the most interesting facts about this species is its extraordinary resemblance to *Sigmodon hispidus*, referred to above. So strong is this resemblance that I can fairly say that, with the exception of the grooved incisors, there is not one single character, cranial or external, which would make me hesitate to refer this specimen to the genus *Sigmodon*; while, as regards the species, the only characters of any sort on which it might be separated from *S. hispidus* are the decidedly shorter tarsus and the more distinct concavity of the frontal bone mentioned above. The very shape of the molars is similar, and different from that of the other species of *Reithrodon*, though, as stated above, the pattern is too worn in the type to be distinguishable; yet the incisors are deeply and distinctly grooved, while in *Sigmodon* they are especially smooth and convex in front and not in the least showing an approximation to a groove, as is done in some other murine non-grooved forms. It is true that in the other species of *Reithrodon* the grooves are often shallow and indistinct; but in these species there is no resemblance whatever to *Sigmodon*, and their locality, the extreme south of S. America, is the very opposite of intermediate. Neither can we explain this resemblance of *R. alstoni* to *Sigmodon* by the theory of “mimicry,” as the likeness is quite as strong in the cranial as in the external characters, and also because *Sigmodon* is not as yet recorded from Venezuela—though I believe it probably will be, as I have recently seen what I believe to be a specimen of that genus obtained in Ecuador.

There is of course another explanation possible, namely that *R. alstoni* has been independently developed from some *Sigmodont* form and has nothing to do with *Reithrodon*, except what is shared by the other American Murinæ. Considering how different from the other *Reithrodons* the general appearance and shape of skull of *R. alstoni* are, it seems just possible that this may be the case; and if so, it would show that grooved incisors are not nearly so important a character, at least in the New-World Murines, as they have always been taken to be, and would on the whole be strongly confirmatory of Dr. Coues's opinion<sup>1</sup> as to the future necessity of amalgamating all the New-World Murinæ (except *Neotoma*) into

<sup>1</sup> Mon. N. Am. Rod. p. 32 (1877).

one large genus, with the present genera *Holochilus*, *Hesperomys*, *Sigmodon*, *Reithrodon*, and *Ochetodon* each representing a subgenus of greater or less extent. Of these names *Sigmodon* would have to be the one to stand for the genus, antedating Waterhouse's appropriate name *Hesperomys* by 14 years.

As, however, we must for the present consider *R. alstoni* as a true *Reithrodon*, the next point we have to consider is its relationship to the other described species. The only species of this rare genus hitherto known are Waterhouse's three original ones, the North-American mice described as belonging to it by Baird and De Sausure having been separated by Dr. Coues as a distinct genus under the name of *Ochetodon*<sup>1</sup>. At the same time that he founded this last genus, Dr. Coues also divided the true *Reithrodon* into two subgenera—*Reithrodon* proper, containing *R. typicus* and *R. cuniculoides*, and *Euneomys*, containing *R. chinchilloides* only. This subdivision certainly seemed to be justified by Waterhouse's figures and descriptions; but now that *R. alstoni* has to be arranged with the others it is at once plain that these subgenera cannot stand as such, that species being, as far as regards the subgeneric characters used by Dr. Coues, precisely intermediate between them. Thus, it has the concave front edge of the zygoma-root, the deep pterygoid fossæ, the rounded descending process of the lower jaw, and the short fifth toe of *Reithrodon* as restricted, and the short incisive foramina, the short palate, and the uncontracted posterior nares of *Euneomys*. Unless, therefore, we are prepared to make a third subgenus for the reception of this species, a course which I think is hardly necessary, we must abolish the subgenera above named and include all the species under *Reithrodon* proper.

With regard to the specific distinctness of *R. cuniculoides* and *R. typicus*, about which Dr. Coues rather naturally expresses some

Fig. 3.



Front part of skull of *R. typicus*.

doubt, it unfortunately happens that the type of the latter in the British Museum is in an extremely bad condition, having all the cranial and palatal portions of the skull broken away; but there remains enough to show that the nasal region, though similar, is not identical with that of *R. cuniculoides*, and that the muzzle is some-

<sup>1</sup> Proc. Ac. Nat. Sci. Phil. 1874, p. 184.

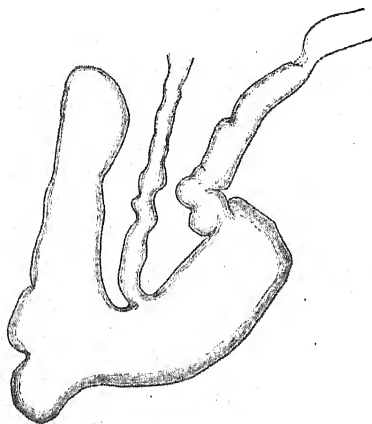
what more strongly made. As the ears also in *R. typicus* are decidedly longer than in *R. cuniculoides*, being 0·74 inch long as against 0·56, measured in each case from the base of the outer edge, and the tarsi are shorter (1·12 against 1·26 without the claws), I do not think that at present we are justified in assuming the existence of intermediate forms, though I have but little doubt that such will yet be found to occur. I exhibit a drawing (fig. 3, p. 694) of what remains of the skull of the type of *R. typicus*, which has only recently been taken out of the skin, and therefore was not figured with the others in the Zoology of the voyage of H.M.S. 'Beagle.'

As to the localities from which specimens of this genus have been obtained, I may mention that, besides the types of Waterhouse's three species, the British Museum possesses a specimen in spirit of *R. chinchilloides*, obtained by the Antarctic Expedition of 1842 close to Cape Horn, and a skin of the same species collected by Mr. T. Bridges in the province of Mendoza, Central Chili. There is also a specimen of *R. typicus* recorded from Parana, La Plata, by Burmeister<sup>1</sup>.

As we have thus two specimens in spirit belonging to the genus *Reithrodon*, besides a good series of *Sigmodon* and *Hesperomys*, I have thought it worth while to examine and compare the alimentary canals of specimens belonging to these genera.

In the first place I exhibit a drawing (fig. 4) of the cæcum

Fig. 4.



Cæcum of *Reithrodon alstoni*.

of *R. alstoni*; it is of the natural size, and shows the shape of the organ very well. In *R. chinchilloides* the cæcum is very

<sup>1</sup> Reise durch die La Plata-Staaten, p. 413 (1861).



much longer, as shown by the Table below, while that of *Sigmodon* is very similar to that of *R. alstoni*; and altogether the cæcum confirms the opinions expressed above as to the affinities of *R. alstoni* with *Sigmodon*. On the other hand the length of the small intestine and the proportion that the colon and rectum bear to that length, are more like those of *Reithrodon* than *Sigmodon*.

The following Table may be useful as giving a few measurements (in inches) of the lengths of the intestines in this group; but, of course, no general deductions can be drawn until a much larger number of specimens has been examined. The Table has been arranged in the order of the percentages that the colon and rectum bear to the small intestine:—

Name.	Length of head and body.	Whole intestine.	Small intestine from pylorus to cæcum.	Colon and rectum.	Percentage of <i>d</i> to <i>c</i> .	Cæcum.
	(a)	(b)	(c)	(d)	(e)	(f)
<i>Reithrodon chinchilloides</i> , <i>Waterh.</i>	5·1	24·3	14·5	9·8	67	3·55
„ <i>alstoni</i> .....	5·3	21·3	13·4	7·9	59	1·85
<i>Hesperomys sumichrasti</i> , <i>De Sauss.</i>	4·7	27·7	17·4	10·3	59	3·55
„ .....	4·7	32·8	20·5	12·3	59	2·8
<i>Sigmodon hispidus</i> .....	5·1	33·5	22·9	10·6	46	2·15
„ .....	5·5	42·5	29·5	13·0	44	2·35
„ .....	4·7	31·9	22·4	9·5	42	1·9
„ .....	5·1	35·9	25·6	10·3	40	1·95
<i>Hesperomys angouya</i> , <i>Desm.</i> .....	4·7	27·9	22·0	5·9	26	1·07
„ <i>cousi</i> , <i>Alst.</i> .....	5·3	36·4	30·0	6·4	21	1·05

We thus see that *R. alstoni* has the short cæcum of *Sigmodon*, while it has even shorter intestines than *R. chinchilloides*; so that, the diameter of the canal being about the same in all, it has the least extent of digestive surface of the specimens measured. The Table also shows how very distinct from the other *Hesperomys H.* (*Nyctomys*) *sumichrasti* is, thus further confirming its separation as a subgenus<sup>1</sup>.

The following synopsis shows briefly the chief characters of the four species of *Reithrodon*:—

- A. Front edge of zygoma-root concave. Fifth digit short (see p. 691).
  - a. Muzzle slender. Ears rather short ..... 1. *R. coniculoides*.
  - β. Muzzle stout. Ears longer; tarsi shorter ..... 2. *R. typicus*.
  - b. Posterior nares uncontracted. Palate ending opposite the last molar ..... 3. *R. alstoni*.
- B. Front edge of zygoma-root perpendicular. Fifth digit long.
  - c. Posterior nares and palate as in *R. alstoni* ..... 4. *R. chinchilloides*.

<sup>1</sup> Cf. Alston, Biol. Centr.-Am., Mamm. p. 148 (1880).

# APPENDIX.

## LIST OF ADDITIONS TO THE SOCIETY'S MENAGERIE

### DURING THE YEAR

1880.

- Jan. 3. 2 Red-under-winged Doves (*Leptoptila rufaxilla*). Presented by Dr. A. Stradling
- 2 Giant Toads (*Bufo aqua*). Presented by Dr. A. Stradling. From Savanilla.
- 1 Tuberculated Iguana (*Iguana tuberculata*). Presented by Dr. A. Stradling.
6. 1 Brown Bear (*Ursus arctos*), ♀. Presented by Messrs. Jas. Veitch & Son & Mr. Charles Maries. From Japan.
- 3 Tigrine Snakes (*Tropidonotus tigrinus*). Presented by Messrs. Jas. Veitch & Son & Mr. Charles Maries.
- 1 Japanese Hawk-Eagle (*Spizaetus orientalis*). Presented by Harry Pryer, Esq., C.M.Z.S. See P. Z. S. 1880, p. 67.
- 3 Oystercatchers (*Haematopus ostralegus*). Purchased.
- 3 Brant Geese (*Bernicla brenta*). Purchased.
- 2 Corean Pigs (*Sus scrofa*, var. ?), ♂ and ♀. Presented by Sydney Ringer, Esq., M.D. From the island of Quelpaert, Corea.
7. 1 Golden Conure (*Conurus luteus*). Received in exchange.
8. 2 Common Gulls (*Larus canus*). Presented by George Weaver, Esq.
9. 1 Arabian Gazelle (*Gazella arabica*), ♀. Presented by Miss M. Murray.
- 1 Robben-Island Snake (*Coronella phocaenae*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
- 4 Rufescent Snakes (*Leptodira rufescens*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
- 1 Rhomb-marked Snake (*Psammodromus rhombatus*). Presented by Eustace Pillans, Esq.
12. 1 Bar-tailed Godwit (*Limosa lapponica*). Presented by F. Cresswell, Esq.
- 1 Grey Plover (*Squatarola helvetica*). Presented by F. Cresswell, Esq.
- 6 Knots (*Tringa canutus*). Presented by F. Cresswell, Esq.
- 13 Dunlins (*Tringa cinclus*). Presented by F. Cresswell, Esq.
13. 2 Bankiva Jungle-fowls (*Gallus bankiva*), ♂ and ♀. Presented by W. Dunn, Esq., C.E., C.M.Z.S.

- Jan. 13. 2 Starred Tortoises (*Testudo stellata*). Presented by W. Dunn, Esq., C.E., C.M.Z.S.
15. 3 Chinchillas (*Chinchilla lanigera*). Purchased.
1. Grey Struthidea (*Struthidea cinerea*). Purchased.
16. 1 Red-throated Amazon (*Chrysotis collaria*). Purchased.
1. Changeable Troupial (*Quiscalus versicolor*). Purchased.
1. Greater Spotted Woodpecker (*Picus major*). Purchased. From Siberia.
- 2 Fulmar Petrels (*Fulmarus glacialis*). Deposited.
17. 1 Rhesus Monkey (*Macacus erythraeus*), ♀. Presented by F. C. Grosvenor, Esq.
19. 4 Common Peafowl (*Pavo cristatus*), 2 ♂ and 2 ♀. Purchased.
2. Knots (*Tringa canutus*). Purchased.
1. Kittiwake Gull (*Rissa tridactyla*). Presented by W. H. Cope, Esq., F.Z.S.
20. 1 Common Raven (*Corvus corax*). Presented by C. H. Knight, Esq.
1. Common Barn-Owl (*Strix flammea*). Presented by Mr. G. D. Edwards.
21. 4 Wigeons (*Marca penelope*), 2 ♂ and 2 ♀. Purchased.
1. Common Wild Duck (*Anas boschas*), ♀. Purchased.
2. Scaup Ducks (*Fuligula marila*), ♂ and ♀. Purchased.
22. 1 Jaguar (*Felis onca*), ♂. Purchased.
24. 1 Chinese Rhesus Monkey (*Macacus lasiotis*), ♂. Presented by Messrs. John Morris and A. H. Brown. From Shanghai.
2. Martinican Doves (*Zenaida martinicana*). Presented by Capt. H. King.
25. 2 Blue-eyed Cockatoos (*Cacatua ophthalmica*). Presented by the Rev. Geo. Brown, C.M.Z.S. From Duke-of-York's Island. See P. Z. S. 1880, p. 67.
26. 1 Black Lemur (*Lemur macaco*), ♂. Purchased.
27. 1 Ocelot (*Felis pardalis*). Presented by G. Whitmore Christie, Esq.
28. 5 Undulated Grass-Parrakeets (*Melopsittacus undulatus*). Deposited.
30. 1 Tamandua Anteater (*Tamandua tetradactyla*). Purchased.
31. 1 Feline Douroucouli (*Nyctipithecus vociferans*). Presented by the Rt. Hon. Hugh Childers, M.P.
1. Little Grebe (*Podiceps minor*). Presented by Thos. Edward Pryce, Esq.
- Feb. 3. 1 Sykes's Monkey (*Cercopithecus albicularis*), ♀. Presented by Mrs. R. Wynne Roberts.
4. 1 Sykes's Monkey (*Cercopithecus albicularis*), ♀. Presented by Miss Mabel Beale.
1. Sambar Deer (*Cervus aristotelis*), ♂. Presented by W. H. Stevenson, Esq.
1. Kittiwake Gull (*Rissa tridactyla*). Presented by H. R. Bower, Esq.
5. 2 Thars (*Capra jemlaica*), 2 ♀. Presented by H.R.H. The Prince of Wales, K.G. See P. Z. S. 1880, p. 186.
6. Himalayan Monauls (*Lophophorus impeyanus*), 3 ♂ and 3 ♀. Presented by H.R.H. The Prince of Wales, K.G.
3. Horned Tragopans (*Cerionis satyra*), 1 ♂ and 2 ♀. Presented by H.R.H. The Prince of Wales, K.G.
1. Temminck's Tragopan (*Cerionis temmincki*), ♂. Presented by H.R.H. The Prince of Wales, K.G.

- Feb. 5. 1 Spotted Turtle Dove (*Turtur suratensis*). Presented by H.R.H. The Prince of Wales, K.G.  
 1 Wood-Owl (*Syrnium aluco*). Presented by Wm. Addison, Esq.
6. 2 Black Lemurs (*Lemur macaco*), ♂ and ♀. Presented by the Rev. G. P. Badger, D.C.L., F.Z.S.  
 1 Stanley Crane (*Tetrapteryx paradisea*). Presented by Capt. E. Jones, R.M.S.S. 'Conway Castle.'
10. 1 Bewick's Swan (*Cygnus bewicki*). Deposited.
11. 1 Red-fronted Lemur (*Lemur rufifrons*), ♂. Presented by W. C. Gordon, Esq.  
 2 Hawk-headed Caiques (*Derophtys accipitrinus*). Presented by Chas. Fricke, Esq.  
 1 Peregrine Falcon (*Falco peregrinus*). Presented by F. R. Hayes, Esq. From Newfoundland.
12. 1 Spur-winged Goose (*Plectropterus gambensis*). Presented by R. B. Dobree, Esq.  
 1 Sharp-nosed Crocodile (*Crocodilus acutus*). Purchased.  
 1 Robben-Island Snake (*Coronella phocorum*). Presented by W. Porter, Esq.  
 1 Serval (*Felis serval*). Purchased.
13. 1 Hoolock Gibbon (*Hylobates hoolock*).  
 1 White-handed Gibbon (*Hylobates lar*). Deposited.
14. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by J. Snowdon Henry, Esq., F.Z.S.  
 1 Rhesus Monkey (*Macacus erythraeus*), ♀. Presented by J. Snowdon Henry, Esq., F.Z.S.  
 2 Hybrid Macaque Monkeys (between *Macacus cynomolgus* and *Macacus erythraeus*). Presented by J. Snowdon Henry, Esq., F.Z.S.
16. 1 Grey Plover (*Squatarola helvetica*). Purchased.  
 1 Bar-tailed Godwit (*Limosa lapponica*). Purchased.
17. 14 Seven-banded Snakes (*Tropidonotus leberis*). Born in the Menagerie.  
 1 Ocellated Monitor (*Monitor ocellatus*). Purchased.
19. 2 Burrhel Wild Sheep (*Ovis burrhel*), ♂ and ♀. Purchased. See P. Z. S. 1880, p. 186.  
 4 Common Bluebirds (*Sialia wilsoni*), 2 ♂ and 2 ♀. Purchased.
21. 1 Macaque Monkey (*Macacus cynomolgus*). Presented by Mr. Macaulay.  
 1 Pig-tailed Monkey (*Macacus nemestrinus*), ♂. Deposited.
22. 1 Water-Rail (*Rallus aquaticus*). Presented by T. J. Mann, Esq.
23. 1 Serval (*Felis serval*). Purchased.  
 1 Broad-fronted Crocodile (*Crocodilus frontatus*). Purchased.  
 1 Kittiwake Gull (*Rissa tridactyla*). Purchased.  
 3 Greek Land-Tortoises (*Testudo graeca*). Purchased.
24. 1 Allen's Galago (*Galago alleni*). Purchased.  
 1 Scops Owl (*Scops gin*). Presented by W. H. St. Quintin, Esq.  
 2 Rufous-necked Weaver birds (*Hyphantornis testor*). Presented by W. H. St. Quintin, Esq.  
 1 Fallow Deer (*Cervus dama*), ♀. Presented by Louis Hirsch, Esq.
27. 2 Grey-headed Love-birds (*Agapornis cana*). Purchased.
28. 8 Summer Ducks (*Aix sponsa*), 4 ♂ and 4 ♀. Purchased.
- 8 Mandarin Ducks (*Aix galericulata*), 4 ♂ and 4 ♀. Purchased.
29. 5 Common Lapwings (*Vanelus cristatus*). Purchased.

- Mar. 1. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Deposited.  
 1 Red Kangaroo (*Macropus rufus*), ♀. Born in the Menagerie.
2. 1 Crab-eating Raccoon (*Procyon cancrivorus*). Purchased.  
 1 Crab-eating Opossum (*Didelphys cancrivora*). Presented by George Dundas, Esq.  
 1 Leadbeater's Cockatoo (*Cacatua leadbeateri*). Presented by J. Veale, Esq.  
 1 Herring-Gull (*Larus argentatus*). Presented by Mrs. H. D. Martin.
3. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Mrs. S. M. Young.  
 1 Malbrouck Monkey (*Cercopithecus cynosurus*). Presented by Lady Dorothy Nevill.  
 1 Harpy Eagle (*Thrasaetus harpyia*). Presented by Stephen-son Clarke, Esq.  
 1 Harnessed Antelope (*Tragelaphus scriptus*). Purchased.
4. 1 Greater Sulphur-crested Cockatoo (*Cacatua galerita*). Presented by F. Phillips, Esq.  
 1 Common Pheasant (*Phasianus colchicus*, pied var.), ♂. Presented by W. T. Leveritt, Esq.
5. 2 Wild Boars (*Sus scrofa*), ♂ and ♀. Presented by H.H.H. The Prince of Wales, K.G.  
 2 Wild Cats (*Felis catus*). Presented by J. C. Forster, Esq.
6. 1 Gaimard's Rat Kangaroo (*Hypsiprymnus gaimardi*), ♂. Born in the Menagerie.
7. 1 Ring-tailed Coati (*Nasua rufa*). Deposited.
8. 1 Common Marmoset (*Leontideus jacchus*), ♂. Presented by Mme. Sparagnapane.  
 4 Wild Swine (*Sus scrofa*). Born in the Menagerie.
9. 1 Guilding's Amazon (*Chrysotis guildingi*). Purchased.  
 1 Horrid Rattlesnake (*Crotalus horridus*). Presented by Karl J. Schmettau, Esq.
11. 1 Grivet Monkey (*Cercopithecus griseo-viridis*), ♀. Presented by H. E. Laver, Esq.  
 8 Golden Plovers (*Charadrius plumbeus*). Purchased.
12. 1 Persian Gazelle (*Gazella subgutturosa*), ♀. Presented by Mr. W. Dunt.
13. 1 Golden Eagle (*Aquila chrysaetos*). Presented by the Viscount Hill.
14. 1 Red-fronted Lemur (*Lemur rufifrons*), ♂. Presented by the Viscount Hill.  
 1 Natal Antelope (*Cephalophus natalensis*), ♂. Presented by the Viscount Hill.
15. 2 Concave-casqued Hornbills (*Buceros bicornis*), ♂ and ♀. Purchased.
17. 1 Malbrouck Monkey (*Cercopithecus cynosurus*), ♀. Presented by Mrs. Ladell.  
 1 Brazilian Cariama (*Cariama cristata*). Purchased.  
 2 White-backed Trumpeters (*Trochilus leucopterus*). Purchased.  
 1 Marbled Polychrus (*Polychrus marmoratus*). Presented by Dr. A. Stradling, C.M.Z.S.  
 1 Saw-marked Snake (*Philodryas serra*). Presented by Dr. A. Stradling, C.M.Z.S.  
 1 Square-spotted Snake (*Oxyrrhopus dolatus*). Deposited.
18. 2 Concave-casqued Hornbills (*Buceros bicornis*), 2 ♀. Purchased.  
 2 Common Badgers (*Meles meles*). Born in the Menagerie.

- Mar. 19. 2 Spanish Ichneumons (*Herpestes widdringtoni*), 2 ♀. Presented by J. C. Forster, Esq., F.Z.S. See P. Z. S. 1880, p. 288.
- 3 Impeyan Pheasants (*Lophophorus impeyanus*), 1 ♂ and 2 ♀. Deposited.
20. 1 Grivet Monkey (*Cercopithecus griseo-viridis*), ♂. Presented by W. C. Gordon, Esq.
- 1 Sykes's Monkey (*Cercopithecus albicularis*), ♂. Presented by E. S. Savage, Esq.
- 1 Caffre Wild Cat (*Felis caffra*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
- 1 Redshank (*Totanus calidris*). Purchased.
22. 1 Carpet-Viper (*Echis carinata*). Presented by Capt. C. S. Sturt, C.M.Z.S.
- 2 Snow-Buntings (*Plectrophanes nivalis*). Purchased.
- 2 Mountain-Linnets (*Linota flavirostris*). Purchased.
24. 1 Bonnet-Monkey (*Macacus radiatus*), ♀. Presented by J. R. Cullen, Esq.
25. 2 Golden-headed Parrakeets (*Brotogerys tuai*). Purchased.
- 1 Eytton's Tree-Duck (*Dendrocygna eyttoni*). Purchased.
- 1 West-African Python (*Python sebae*). Received in exchange.
26. 2 Striped Hyænas (*Hyæna striata*). Presented by Capt. the Hon. F. G. Hay and — Wyld, Esq.
- 1 American Red Fox (*Canis fulvus*). Presented by Capt. Russell.
- 1 Eland (*Oreos canna*), ♀. Born in the Menagerie.
27. 1 Crested Pigeon (*Ocyphaps lophotes*). Deposited.
- 1 Vulturine Guinea-fowl (*Nemida vulturina*). Deposited.
28. 1 Sambar Deer (*Cervus aristotelis*), ♀. Born in the Menagerie.
29. 2 Dingo Dogs (*Canis dingo*), ♂ and ♀. Received in exchange.
- 2 Common Wombats (*Phascolomys wombat*), ♂ and ♀. Received in exchange.
- 2 Red Kangaroos (*Macropus rufus*), 2 ♀. Received in exchange.
- 2 Vulpine Phalangiers (*Phalangista vulpina*, var.), ♂ and ♀. Received in exchange.
- 2 Mauge's Dasyures (*Dasyurus maugei*). Received in exchange.
- 1 Short-headed Phalanger (*Belideus breviceps*). Received in exchange.
- 2 Emus (*Dromæus novæ-hollandiæ*). Received in exchange.
30. 1 Weeper Capuchin (*Cebus capucinus*), ♂. Deposited.
- 1 Horned Tragopan (*Cerionis satyra*), ♂. Deposited.
31. 1 Prince Albert's Curassow (*Crax alberti*), ♀. Presented by H. B. Whitmarsh, Esq.
- 1 Felino Douroucouli (*Nyctipithecus vociferans*). Purchased.
- 1 Yellow-toothed Cavy (*Cavia flavilens*). Purchased.
- 1 White-spotted Rail (*Rallus maculatus*). Purchased.
- 1 Orinoco Goose (*Chenalopex jubata*). Purchased.
- 1 Brazilian Teal (*Querquedula brasiliensis*). Purchased.
- April 1. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Mr. G. Kirby.
- 1 Long-eared Owl (*Asio otus*). Presented by Dr. W. Anderson. Captured in the Red Sea.
- 1 Greater Black-backed Gull (*Larus marinus*). Presented by E. Thornhill, Esq.
2. 1 West-African Love-bird (*Agapornis pullaria*). Presented by J. W. Gillespie, Esq.

- April 3. 1 Naked-throated Bell-bird (*Chasmorhynchus nudicollis*). Purchased.  
 1 Slowworm (*Anguis fragilis*). Presented by Leslie Jeyes, Esq.  
 5. 1 African Civet Cat (*Viverra civetta*). Presented by P. Lembery, Esq.  
 6. 1 Garnett's Galago (*Galago garnetti*). Presented by A. Chirnside, Esq.  
 1 Marsh-Ichneumon (*Herpestes paludosus*). Presented by A. Chirnside, Esq.  
 1 Banded Ichneumon (*Herpestes fuscatus*). Presented by Mr. A. Ferris.  
 1 Vervet Monkey (*Cercopithecus lalandii*), ♂. Presented by L. Samuel, Esq.  
 1 Cape-Hyrax (*Hyrax capensis*). Purchased.  
 1 Robben-Island Snake (*Coronella phocaenarum*). Purchased.  
 1 Amherst's Pheasant (*Thaumalea amherstiae*), ♀. Received in exchange.  
 1 Black Saki (*Pithecia satanas*). Purchased.  
 1 Great-billed Rhea (*Rhea macrorhyncha*). Purchased.  
 8. 2 Graceful Ground-Doves (*Geopelia cuneata*). Deposited.  
 9. 1 Common Jay (*Garrulus glandarius*). Presented by Mrs. M. Dutton.  
 12. 1 Common Viper (*Vipera berus*). Presented by W. H. B. Pain, Esq.  
 1 Eyra Cat (*Felis cyra*), ♀. Purchased.  
 1 Blate Hornbill (*Buceros elatus*). Purchased.  
 13. 1 Brown Bear (*Ursus arctos*), ♀. Presented by Commander Atwell Lake, R.N.  
 15. 1 Short-nosed Perameles (*Perameles obesula*). Purchased. See P. Z. S. 1880, p. 355.  
 1 Stanley Broadtail (*Platyceercus icterotis*). Purchased.  
 1 Blue-crowned Hanging Parrakeet (*Loriculus galgulus*). Purchased.  
 2 Red-naped Fruit-Pigeons (*Carpophaga paulina*). Purchased.  
 1 Common Squirrel (*Sciurus vulgaris*). Presented by G. Milward, Esq.  
 2 Common Wombats (*Phascocomys wombat*), 2 ♀. Presented by Dr. J. C. Cox, O.M.Z.S.  
 16. 1 Sloth (*Melursus labiatus*). Deposited.  
 2 Black-necked Swans (*Cygnus nigricollis*). Purchased.  
 5 Eyed Lizards (*Lacerta ocellata*). Purchased.  
 1 Collared Fruit-Bat (*Cynonycteris collaris*). Born in the Menagerie.  
 17. 2 Nutmeg-Finches (*Munia undulata*). Presented by Mrs. Hylton Jolliffe.  
 1 Chestnut-breasted Finch (*Donaedra castaneothorax*). Presented by Mrs. Hylton Jolliffe.  
 3 Wheatears (*Saxicola cinanthe*). Purchased.  
 1 Meadow-Pipit (*Anthus pratensis*). Purchased.  
 2 Scaly-breasted Lorikeets (*Trichoglossus chlorolepidotus*). Purchased.  
 18. 1 Ring-tailed Lemur (*Lemur catta*). Purchased.  
 19. 1 Cape Hunting-Dog (*Lycan picta*), ♂. Presented by C. Ernest Pope, Esq. See P. Z. S. 1880, p. 355.  
 1 Blue-fronted Amazon (*Chrysotis aestiva*). Presented by Miss E. Bentley.

- Apr. 19. 1 Common Adder (*Vipera berus*). Presented by W. H. B. Pain, Esq.  
 2 Common Seals (*Phoca vitulina*). Purchased.
20. 1 Black Scoter (*Edemia nigra*). Presented by J. E. Harting, Esq., F.Z.S.  
 1 Many-spotted Snake (*Coronella multimaculata*). Presented by Eustace Pillans, Esq.  
 2 Jameson's Gulls (*Larus jamesoni*). Bred in the Gardens.
21. 1 Drill (*Cynocephalus leucophæus*), ♀. Purchased.  
 1 Long-eared Owl (*Asio otus*). Presented by Capt. C. A. Lumsden.
22. 1 Stump-tailed Lizard (*Trachydosaurus rugosus*). Presented by Capt. J. Thomas.
23. 1 Green-winged Trumpeter (*Psophia viridis*). Presented by R. M. Hyde, Esq.
24. 1 Vulpine Phalanger (*Phalangista vulpina*), ♂. Presented by Capt. Fife.
26. 2 Common Foxes (*Canis vulpes*). Born in the Menagerie.  
 1 Pied Wagtail (*Motacilla yarrelli*). Purchased.  
 2 Elliot's Guinea-fowl (*Numida ellioti*). Presented by the Rev. T. Wakefield.
27. 1 Grey Squirrel (*Sciurus cinereus*, var. *nigra*). Purchased.
28. 1 Koala (*Phascogaleos cinereus*). Purchased. See P. Z. S. 1880, p. 355.  
 2 Common Barn-Owls (*Strix flammea*). Presented by G. E. Dobson, Esq., C.M.Z.S.  
 2 Blue-streaked Lories (*Eos reticulata*). Purchased.  
 1 Blue-faced Lorikeets (*Trichoglossus hæmatodes*). Purchased.
29. 2 Prince Albert's Curassows (*Crax alberti*). Purchased.  
 1 Kinkajou (*Cercoleptes caudivolvulus*). Purchased.  
 1 Hybrid Fowl. Presented by W. D. Powles, Esq., C.M.Z.S.
30. 1 Common Ocelot (*Felis pardalis*). Presented by Stephenson Clark, Esq.
- May 1. 4 Chilian Pintail (*Dafila spinicauda*). Bred in the Gardens.  
 2 Radiated Tortoises (*Testudo radiata*). Presented by Hugh McCubbin, Esq.
3. 5 Bosca's Newts (*Cynops boscai*). Presented by Dr. A. Günther F.R.S. From Spain.
4. 1 Silver-backed Fox (*Canis chama*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.  
 1 King Vulture (*Gypagys papa*). Purchased.  
 2 Tuberculated Lizards (*Iguana tuberculata*). Purchased.
5. 1 Rhesus Monkey (*Macacus erythræus*). Received in exchange.  
 2 Slowworms (*Anguis fragilis*). Presented by O. Thomas, Esq., F.Z.S.
6. 1 Macaque Monkey (*Macacus cynomolgus*). Deposited.  
 2 Foxes (*Canis* sp. inc.). Presented by Lord Lilford, F.Z.S.  
 1 Common Turtle Dove (*Turtur auritus*). Presented by Mr. H. Moore.  
 1 Indian Cobra (*Naia tripudians*). Presented by Mr. W. R. Higham.  
 3 Muscovy Ducks (*Cairina moschata*), 1 ♂ and 2 ♀. Presented by Mr. W. Petty.
7. 1 Ruddy Ichneumon (*Herpestes smithi*), ♂. Presented by A. R. Lewis, Esq.



- May 7. 1 Tayra (*Galictis barbara*), ♂. Presented by G. A. Mühlhauser, Esq.  
 1 Indian Chevrotain (*Tragulus meminna*). Presented by W. H. Ravenscroft, Esq.  
 4 Upland Geese (*Bernicla magellanica*) 2 ♂ and 2 ♀. Purchased.  
 1 Cinereous Vulture (*Fultur monachus*). Presented by Capt. A. Alexander, R.E. From Cyprus.  
 8. 1 Axis Deer (*Cervus axis*). Born in the Menagerie.  
 1 Goffin's Cockatoo (*Cacatua goffini*). Deposited.  
 1 Galeote Lizard (*Calotes ophiomachus*), ♂. Deposited.  
 9. 1 Zebu (*Bos indicus*). Born in the Menagerie.  
 11. 1 Grey-checked Monkey (*Cercocebus albigena*), ♂. Presented by Capt. Thomas.  
 6 Paradise Whydah Birds (*Vidua paradisica*). Presented by J. Colman, Esq., C.M.Z.S.  
 2 Yellow-backed Whydah Birds (*Coliopasser macrurus*). Presented by J. Colman, Esq., C.M.Z.S.  
 1 White-winged Whydah Bird (*Urobrachya albonotata*). Presented by J. Colman, Esq., C.M.Z.S.  
 12 Red-beaked Weaver Birds (*Quelea sanguinirostris*). Presented by J. Colman, Esq., C.M.Z.S.  
 2 Common Bluebirds (*Sialia wilsoni*). Bred in the Gardens.  
 12. 1 Pig-tailed Monkey (*Macacus nemestrinus*), ♂. Presented by J. M. Donovan, Esq.  
 4 Rose-coloured Pastors (*Pastor roseus*). Presented by S. Bayliss, Esq., F.Z.S.  
 13. 1 Indian Gazelle (*Gazella bennetti*), ♂. Presented by Harvey Chevallier, Esq.  
 1 Goffin Cockatoo (*Cacatua goffini*). Presented by W. F. Green, Esq.  
 14. 3 Young Lions (*Felis leo*). Deposited.  
 1 Red-throated Amazon (*Chrysotis collaria*). Deposited.  
 16. 2 Yellow-legged Herring-Gulls (*Larus cachinnans*). Bred in the Gardens.  
 18. 2 Common Nightingales (*Daulias huscina*). Purchased.  
 1 Canary Finch (*Serinus canarius*), ♂. Purchased. Captured at Hampstead.  
 19. 1 Black Wallaby (*Halmaturus ualabatus*), ♀. Born in the Menagerie.  
 2 Toco Toucans (*Rhamphastos toco*). Purchased.  
 1 Brown Passerine Owl (*Glaucidium phalaenoides*). Purchased.  
 1 Rusty Urubitinga (*Urubitinga meridionalis*). Purchased.  
 1 Downy Owl (*Nyctalex torquata*). Purchased.  
 1 Long-eared Owl (*Asio otus*). Presented by G. E. Dobson, Esq.  
 20. 1 Pincho Monkey (*Midas edipus*), ♂. Presented by Mrs. Henry Denman Macaulay.  
 2 Black-tailed Hawfinches (*Coccothraustes melanurus*), ♂ and ♀. Purchased.  
 4 Golden Sparrows (*Auripasser euchlorus*). Purchased.  
 4 Blood-breasted Pigeons (*Phlogoenas cruentata*). Purchased.  
 21. 1 Black-faced Kangaroo (*Macropus melanops*), ♂. Presented by Sir Harry St. George Ord, C.B., F.Z.S.  
 4 Short-tailed Wallabies (*Halmaturus brachypus*) 3 ♂ and 1 ♀. Presented by Sir Harry St. George Ord, C.B., F.Z.S.  
 3 Vulpine Phalangiers (*Phalangista vulpina*). Presented by Sir Harry St. George Ord, C.B., F.Z.S.

- May 21. 3 White-backed Piping Crows (*Gymnorhina leuconota*). Presented by Sir Harry St. George Ord, C.B., F.Z.S.
- 1 Javan Chevrotain (*Tragulus javanicus*), ♂. Presented by Mrs. L. Dudfield.
- 1 Guilding's Amazon (*Chrysotis guildingi*). Purchased.
- 1 Gannet (*Sula bassana*). Purchased.
22. 1 Brown Capuchin (*Cebus fatuellus*), ♂. Presented by Chas. A. Craven, Esq.
- 1 Ocelot (*Felis pardalis*). Presented by Chas. A. Craven, Esq.
- 1 Ring-tailed Lemur (*Lemur catta*), ♀. Presented by Chas. A. Craven, Esq.
- 1 Eyed Lizard (*Lacerta ocellata*). Presented by Lieut. L. L. Fenton. From San Remo, North Italy.
- 1 Æsculapian Snake (*Coleber æsculapii*). Presented by Lieut. L. L. Fenton. From San Remo, North Italy.
- 6 Viperine Snakes (*Tropidonotus viperinus*). Presented by Lieut. L. L. Fenton. From San Remo, North Italy.
- 1 Bordeaux Snake (*Coronella girondica*). Presented by Lieut. L. L. Fenton. From San Remo, North Italy.
- A Collection of Young Salmonidæ. Presented by F. Buckland, Esq., F.Z.S.
24. 2 Cashmere Shawl-Goats (*Capra hircus*), ♂ and ♀. Presented by Wm. Taylor, Esq., M.D.
- 3 Cashmere Shawl-Goats (*Capra hircus*), 2 ♂ and 1 ♀. Deposited.
- 12 Yellow-billed Ducks (*Anas xanthorhyncha*). Bred in the Gardens.
25. 1 Alexandrine Parrakeet (*Palæornis alexandri*). Presented by C. Williams, Esq.
- 2 West-African Love-birds (*Agapornis pullaria*), ♂ and ♀. Presented by C. Williams, Esq.
- 1 Common Raven (*Corvus corax*). Presented by C. Williams, Esq.
- 1 Common Canary (*Serinus canarius*, var.). Presented by C. Williams, Esq.
- 1 Crimson-eared Waxbill (*Estrela phainicotis*). Presented by C. Williams, Esq.
- 2 Crested Screamers (*Chauna chavaria*). Purchased.
26. 1 Malbrouck Monkey (*Cercopithecus cymosurus*). Deposited.
- 1 Marked Paradoxure (*Paradoxurus stigmaticus*), ♀. From Southern Borneo. Purchased.
- 1 Axis Deer (*Cervus axis*), ♀. Born.
27. 1 Vervet Monkey (*Cercopithecus lalandii*), ♂. Presented by Frank Simpson, Esq.
- 1 Balearic Crowned Crane (*Balearica pavonina*). Presented by Frank Simpson, Esq.
- 2 Side-striped Jackals (*Canis lateralis*). Purchased. See P. Z. S. 1880, p. 450.
28. 1 Grey-cheeked Monkey (*Cercocebus albigena*), ♀. Presented by the Earl of Lonsdale, F.Z.S.
- 1 Anguine Lizard (*Chamaeosaura anguina*). Presented by Eustace Pillans, Esq. From the Cape colony.
- 1 South-American Rat-Snake (*Spilotes variabilis*). Presented by G. H. Hawtayne, Esq., C.M.Z.S.
- 3 Black Tortoises (*Testudo carbonaria*). Purchased.
30. 2 Purple-faced Monkeys (*Semnopithecus leucopymnus*). Purchased.

- May 30. 1 Hocheur Monkey (*Cercopithecus nictitans*). Purchased.  
 1 African Brush-tailed Porcupine (*Atherura africana*). Purchased.  
 2 Spotted Hyænas (*Hyæna crocuta*). Purchased.  
 1 American Bison (*Bison americanus*). Purchased.  
 3 Indian Tantal (*Tantalus leucocephalus*). Purchased.  
 5 Black-necked Swans (*Ocygnus nigricollis*). Purchased.  
 1 Schomburgk's Deer (*Cervus schomburgkii*), ♂. Purchased.  
 1 Lühdorf's Deer (*Cervus luehdorfi*), ♂. Purchased. See P. Z. S. 1880, p. 451.  
 1 Common Rook (*Corvus frugilegus*), albino. Presented by R. Clayton, Esq.
31. 1 Red Lory (*Eos rubra*). Purchased.  
 1 Ornamental Lorikeet (*Trichoglossus ornatus*). Purchased.  
 1 White-billed Parrakeet (*Tanygnathus albirostris*). Purchased.  
 1 Noble Macaw (*Ara nobilis*). Purchased.  
 2 Yellow-fronted Amazons (*Chrysotis ochrocephala*). Purchased.  
 2 Black-headed Conures (*Conurus nanday*). Purchased.  
 1 White-headed Parrot (*Pionis senilis*). Purchased.  
 2 Cinereous Waxbills (*Estrela cærulescens*). Purchased.  
 1 Crimson-eared Waxbill (*Estrela phœnicotis*). Purchased.  
 4 Bengal Weaver Birds (*Ploceus bengalensis*). Purchased.  
 1 Ludio Monkey (*Cercopithecus ludio*), ♀. Presented by J. G. Hamilton, Esq.  
 1 Mona Monkey (*Cercopithecus mona*), ♀. Presented by J. G. Hamilton, Esq.  
 1 Pig-tailed Monkey (*Macacus nemestrinus*). Presented by Mr. W. C. Lawes.
- June 1. 1 Ring-tailed Lemur (*Lemur catta*), ♂. Purchased.  
 1 Black-footed Penguin (*Spheniscus demersus*). Purchased.  
 1 Smooth Snake (*Coronella levis*). Presented by T. J. Mann, Esq.  
 36 Golden Tench (*Tinca vulgaris*, var.). Presented by Lord Walsingham, F.Z.S.
2. 1 Anoa (*Anoa depressicornis*), ♀. Received in exchange.  
 1 Brahminy Kite (*Haliastur indus*). Purchased.  
 1 Brown Crane (*Grus canadensis*). Purchased.  
 1 Levaillant's Parrot (*Psecephalus robustus*). Purchased.  
 1 Russ's Weaver Bird (*Quelea russi*). Presented by Mr. G. F. Westerman.  
 1 Double-crested Pigeon (*Lopholanius antarcticus*). Purchased.  
 2 Black Rats (*Mus rattus*, var.). Presented by William Cubitt, Esq.
3. 1 Leucoryx Antelope (*Oryx leucoryx*), ♂. Purchased.  
 2 Victoria Crowned Pigeons (*Goura victoria*). Purchased.  
 1 White-throated Capuchin (*Cebus hypoleucus*), ♂. Presented by Miss Baker.  
 2 Yellow-headed Troupials (*Xanthocephalus icterocephalus*). Presented by W. A. Conklin, Esq.
4. 1 Toque Monkey (*Macacus pileatus*), ♀. Presented by H. P. Brennan, Esq., R.N.  
 1 Common Kingfisher (*Alcedo ispida*). Presented by C. H. Greaves, Esq.  
 1 Common Otter (*Lutra vulgaris*). Purchased.  
 2 Turquoise Parrakeets (*Euphema pulchella*). Bred in the Gardens.

- June 4. 1 Geoffroy's Dove (*Peristera geoffroyi*). Bred in the Gardens.  
 1 Wonga-Wonga Pigeon (*Leucosarcia picata*). Bred in the Gardens.
5. 1 Brown Bear (*Ursus arctos*). Presented by C. Overbeck, Esq.  
 1 Dingo Dog (*Canis dingo*). Presented by Lord Ernest Gordon.  
 2 Silky Marmosets (*Midas rosalia*). Purchased.  
 3 Chinchillas (*Chinchilla lanigera*). Purchased.  
 3 Ashy-headed Geese (*Bernicla poliocephala*). Purchased.  
 1 Upland Goose (*Bernicla magellanica*). Purchased.
6. 1 White Pelican (*Pelecanus onocrotalus*). Presented by J. Simonds, Esq.
7. 1 Black-eared Marmoset (*Hapale penicillata*), ♂. Presented by G. Mantell, Esq.  
 1 Axis Deer (*Cervus axis*), ♂. Born in the Menagerie.
9. 2 Swift Parrakeets (*Lathamus discolor*). Purchased.
10. 3 Slender Loris (*Loris gracilis*). Presented by Lord Lilford, F.Z.S.  
 1 Musky Lorikeet (*Trichoglossus concinnus*). Presented by Mr. A. H. Jamrach.
11. 1 Jaguar (*Felis onca*). Purchased.  
 2 Common Boas (*Boa constrictor*). Purchased.  
 1 Horsfield's Tortoise (*Testudo horsfieldi*). Presented by Capt. W. Cotton. From Afghanistan.  
 1 Smooth Snake (*Coronella levis*). Presented by W. Penny, Esq.  
 1 Japanese Deer (*Cervus sika*). Born in the Menagerie.
12. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by T. H. Adey, Esq.
13. 1 Common Kingfisher (*Alcedo ispida*). Presented by O. W. Craven, Esq.
14. 1 Leonine Monkey (*Macacus leoninus*), ♂. Received in exchange from the Zoological Gardens, Calcutta. See P. Z. S. 1880, p. 537.  
 1 Slow Loris (*Nycticebus tardigradus*). Received in exchange from the Zoological Gardens, Calcutta.  
 2 Bay Bamboo-Rats (*Rhizomys badius*). Received in exchange from the Zoological Gardens, Calcutta.  
 2 Sumatran Wild Dogs (*Canis rutilans*), ♂ and ♀. Received in exchange from the Zoological Gardens, Calcutta.  
 1 Javan Adjutant (*Leptoptilus javanicus*). Received in exchange from the Zoological Gardens, Calcutta.  
 1 Rhesus Monkey (*Macacus erythraeus*). Presented by W. Connell, Esq.  
 1 Azara's Fox (*Canis azarae*). Presented by Edw. Cooper, Esq.  
 1 Gould's Harrier (*Circus gouldi*). Presented by Capt. J. Seaborne.
- 4 Beautiful Finches (*Estrela bella*). Purchased.
15. 1 Greater Sulphur-crested Cockatoo (*Cacatua galerita*). Presented by Mrs. M. A. Brown.  
 1 Axis Deer (*Cervus axis*), ♂. Born in the Menagerie.  
 4 Mandarin Ducks (*Aix galericulata*). Bred in the Menagerie.  
 4 Variegated Sheldrakes (*Tadorna variegata*). Bred in the Menagerie.
16. 2 Virginia Deer (*Cariacus virginianus*), ♂ and ♀. Purchased.  
 1 Salt-water Terrapin (*Clemmys terrapin*). Presented by Mr. A. D. Bartlett.

- June 17. 1 Rhesus Monkey (*Macacus erythræus*), ♂. Presented by George L. Anlot, Esq.  
 1 Wapiti Deer (*Cervus canadensis*), ♀. Born in the Menagerie.  
 1 Common Ocelot (*Felis pardalis*), Purchased.  
 1 Quica Opossum (*Didelphis quica*). Presented by Capt. F. Ball.  
 2 Common Gulls (*Larus canus*). Presented by J. Castell, Esq.  
 18. 3 Siamese Pheasants (*Euplocamus praelatus*). Bred in the Gardens.  
 2 Horned Tragopans (*Cerionis satyra*). Bred in the Gardens.  
 2 Peacock Pheasants (*Polyplectron chinquis*). Bred in the Gardens.  
 19. 1 Brown Capuchin (*Cebus fatuellus*). Purchased.  
 1 Weeper Capuchin (*Cebus capucinus*). Purchased.  
 1 Australian Crane (*Grus australasiana*). Deposited.  
 1 Dominican Gull (*Larus dominicanus*), jr. Presented by Capt. R. Bower.  
 21. 1 Japanese Deer (*Cervus sika*), ♀. Born in the Menagerie.  
 22. 1 Arabian Gazelle (*Gazella arabica*), ♀. Presented by Capt. Ticehurst.  
 1 Crested Ground-Parrakeet (*Calopsitta novæ hollandiæ*). Presented by Miss M. S. Spooner.  
 3 Ruddy Sheldrakes (*Tadorna rutila*), ♂. Purchased.  
 24. 1 Collared Fruit-Bat (*Cynonycteris collaris*). Born in the Menagerie.  
 3 Red-beaked Weaver Birds (*Quelea sanguinirostris*). Presented by the Marchioness of Westminster.  
 1 Greater White-crested Cockatoo (*Cacatua cristata*). Presented by Mrs. A. L. Chetwode.  
 25. 1 Ocellated Monitor (*Monitor ocellatus*). Purchased.  
 26. 1 Barbary Ape (*Macacus inuus*), ♀. Deposited.  
 1 Common Genet (*Genetta vulgaris*), ♀. Presented by G. H. Thunder, Esq., R.N.  
 1 Tufted Umbre (*Scopus umbretta*). Purchased. See P. Z. S. 1880, p. 537.  
 2 Sandwich-Island Geese (*Bernicla sandvicensis*). Purchased.  
 2 Blood-rumped Parrakeets (*Psephotus haematonotus*). Purchased.  
 1 Emu (*Dromæus novæ-hollandiæ*). Presented by A. McIlwraith, Esq., F.Z.S.  
 27. 1 Celebean Rail (*Rallus celebensis*). Purchased.  
 1 Australian Rail (*Rallus pectoralis*). Purchased.  
 28. 1 Red Deer (*Cervus elaphus*), ♂. Born in the Menagerie.  
 1 Doubtful Toucan (*Ramphastos ambiguus*). Purchased.  
 29. 1 Banded Ichneumon (*Herpestes fasciatus*). Presented by H. Hall, Esq.  
 1 Reeves's Muntjac (*Cervulus reevesi*), ♀. Bred in the Menagerie.  
 2 Common Peafowls (*Pavo cristata*). Presented by Miss Wedderburn.  
 3 Upland Geese (*Bernicla magellanica*). Bred in the Gardens.  
 30. 1 Beautiful Wood-Hawk (*Dryotriorchis spectabilis*). Purchased.  
 1 Brown Mock Thrush (*Harporhynchus rufus*). Purchased.  
 2 Bronze-spotted Doves (*Chalcopelia chalcospilos*). Purchased.  
 2 Tambourine Pigeons (*Tympanistria bicolor*). Purchased.  
 6 Chinese Quails (*Coturnix chinensis*), 2 ♂ and 4 ♀. Purchased.

- June 30. 2 American Kestrels (*Tinnunculus sparverius*). Purchased.  
 1 Ocellated Monitor (*Monitor ocellatus*). Purchased.  
 1 Rhesus Monkey (*Macacus erythraeus*), ♂. Presented by Mr. Fred. Felix.  
 1 Java Sparrow (*Padda oryzivora*). Presented by St. Julien Arabin, Esq.  
 1 Spotted-sided Finch (*Amadina lathamii*). Presented by St. Julien Arabin, Esq.  
 1 Chestnut-eared Finch (*Amadina castanotis*). Presented by St. Julien Arabin, Esq.  
 2 Chestnut-bellied Finches (*Munia rubronigra*). Presented by St. Julien Arabin, Esq.  
 2 Red-beaked Weaver Birds (*Quelea sanguinirostris*). Presented by St. Julien Arabin, Esq.  
 1 Crimson-crowned Weaver Bird (*Euplectes flammiceps*). Presented by St. Julien Arabin, Esq.  
 1 Paradise Whydah Bird (*Fidua paradisaica*). Presented by St. Julien Arabin, Esq.  
 1 Brazilian Tanager (*Ramphocelus brasilius*). Presented by St. Julien Arabin, Esq.  
 1 Yellow-bellied Liothrix (*Liothrix luteus*). Presented by St. Julien Arabin, Esq.  
 1 Bearded Tit (*Panurus biarmicus*). Presented by St. Julien Arabin, Esq.
- July 1. 1 Common Marmoset (*Hapale jacchus*), ♂. Presented by T. Douglas Murray, Esq., F.Z.S.  
 1 Slender-billed Cockatoo (*Licmetis tenuirostris*). Presented by H. F. Bussey, Esq.  
 2. 2 Coypu Rats (*Myopotamus coypus*). Deposited.  
 1 Cereopsis Goose (*Cereopsis nova-hollandiae*), ♂. Purchased.  
 3. 2 Huanacos (*Lama huanacos*). Deposited.  
 4. 1 Jaguar (*Felis onca*). Presented by Lord Lilford, F.Z.S.  
 2 American Barn-Owls (*Strix flammea*). Deposited.  
 5. 1 Black-eared Marmoset (*Hapale penicillata*), ♂. Deposited.  
 1 Mouflon (*Ovis musimon*), ♀. Born in the Menagerie.  
 1 Greater Sulphur-crested Cockatoo (*Cacatua galerita*). Deposited.  
 6. 2 Yellow-footed Rock-Kangaroos (*Petrogale xanthopus*). Received in exchange from the Zoological Gardens, Berlin.  
 2 Bewick's Swans (*Cygnus bewickii*). Received in exchange from the Zoological Gardens, Berlin.  
 7. 4 Egyptian Jerboas (*Dipus aegyptius*). Presented by the Earl of Winterton.  
 2 Slowworms (*Anguis fragilis*). Presented by J. Rodney, Esq.  
 8. 1 Green Woodpecker (*Gecinus viridis*). Presented by C. H. Davis, Esq.  
 1 Ostrich (*Struthio camelus*), ♀. Deposited.  
 9. 1 Ocelot (*Felis pardalis*). Presented by C. B. Robinson, Esq.  
 1 Ring-tailed Coati (*Nasua rufa*). Presented by C. B. Robinson, Esq.  
 2 Blood-breasted Pigeons (*Phlogoenas cruentata*). Presented by J. Day, Esq.  
 1 Herring-Gull (*Larus argentatus*). Presented by Mr. A. Kendall.  
 10. 1 Larger Hill-Mynah (*Gracula intermedia*). Presented by N. P. Fenwick, Esq., F.Z.S.

- July 11. 1 Common Raven (*Corvus corax*). Presented by the Earl of Bradford, F.Z.S.
- 11 Common Guillemots (*Uria troile*). Presented by Sir Hugh Dalrymple, Bart.
- 2 Kittiwake Gulls (*Rissa tridactyla*). Presented by Sir Hugh Dalrymple, Bart.
12. 1 Common Badger (*Meles taxus*). Presented by Mr. Frank G. Haines.
- 1 Eland (*Oreos canna*), ♂. Born in the Menagerie.
13. 1 Burchell's Zebra (*Equus burchelli*), ♀. Received in exchange.
- 1 Huanaco (*Lama huanacos*), ♀. Presented by the Marquis of Queensberry.
- 1 Common Rhea (*Rhea americana*). Presented by the Marquis of Queensberry.
- 4 Green Woodpeckers (*Gecinns viridis*). Purchased.
- 2 Green Woodpeckers (*Gecinns viridis*). Presented by Mr. J. King.
- 1 Lesser Black-backed Gull (*Larus fuscus*). Presented by Mr. Beazley.
14. 1 Rhesus Monkey (*Macacus erythraeus*), ♀. Presented by Mrs. C. Salvin.
- 1 Common Seal (*Phoca vitulina*). Purchased.
- 1 Common Heron (*Ardea cinerea*). Deposited.
15. 1 Common Paradoxure (*Paradoxurus typus*), ♂. Presented by Col. C. S. Sturt, C.M.Z.S.
16. 1 Goffin's Cockatoo (*Cacatua goffini*). Presented by Miss Bartlett.
- 2 Red-legged Partridges (*Cucubis rufa*). Presented by Mr. W. H. St. Quintin.
- 2 Northern Buzzards (*Buteo borealis*). Presented by Mr. W. H. St. Quintin.
- 2 Japanese Pheasants (*Phasianus vulgaris*). Purchased.
- 1 Bar-tailed Pheasant (*Phasianus reevesi*). Purchased.
- 2 Lions (*Felis leo*), ♂ and ♀. Born in the Menagerie.
- 4 Ring-tailed Coatis (*Nasua rufa*). Presented by Lt.-Col. J. A. Smith, 1st W.I.R.
18. 1 Greek Land-Tortoise (*Testudo graeca*). Presented by J. Holt Esq.
- 1 Common Hedgehog (*Erinaceus europaeus*). Presented by J. Holt, Esq.
- 2 American Darters (*Plotus anhiya*). Presented by Gerald Waller, Esq.
- 1 Spotted Salamander (*Salamandra maculosa*). Presented by Mr. L. C. Brook.
- 1 Slowworm (*Anguis fragilis*). Presented by Mr. L. C. Brook.
- 1 Speckled Terrapin (*Clemmys guttata*). Presented by Mr. L. C. Brook.
19. 1 Common Bluebird (*Sialia wilsonii*). Bred in the Gardens.
- 1 Bronze-winged Pigeon (*Thaps chalcoptera*). Bred in the Gardens.
- 1 Horned Lizard (*Phrynosoma cornutum*). Presented by Theo. S. Harris, Esq.
20. 1 Crimson-crowned Weaver Bird (*Euplectes flammiceps*). Deposited.
- 2 Common Bluebirds (*Sialia wilsonii*). Deposited.
- 2 Ocellated Turkeys (*Meleagris ocellata*), 2 ♂. Presented by W. E. Sibeth, Esq. See P. Z. S. 1880, p. 537.

- July 21. 2 Red-backed Pelicans (*Pelecanus rufescens*). Purchased.
22. 1 Great Eagle-Owl (*Bubo maximus*). Presented by Mr. Lindsay von Julin.
- 5 Four-rayed Snakes (*Elaphis quaterradiatus*). Deposited.
- 1 Lacertine Snake (*Caclopeltis lacertina*). Deposited.
- 4 Dahl's Snakes (*Zamenis dahl*). Deposited.
- 13 Vivacious Snakes (*Tachymenis vivax*). Deposited.
- 1 Four-lined Snake (*Coluber quadrilineatus*, var. *leopardinus*). Deposited.
- 1 Chinese Elaphis (*Elaphis sauramates*). Deposited.
23. 1 Green Monkey (*Cercopithecus callitrichus*), ♂. Presented by Frederick Peake, Esq., F.Z.S.
- 5 Australian Wild Ducks (*Anas superciliosa*). Bred in the Gardens.
- 3 Garganey Teal (*Querquedula circia*). Bred in the Gardens.
- 3 Common Teal (*Querquedula crecca*). Bred in the Gardens.
24. 2 Horned Tragopans (*Cerionis satyra*). Bred in the Gardens.
- 1 Peacock Pheasant (*Polyplectron chinquis*). Bred in the Gardens.
25. 2 Great Eagle-Owls (*Bubo maximus*). Purchased.
26. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Mr. J. Anson.
- 10 Amaduvade Finches (*Estrela umandava*). Presented by J. W. Wilson, Esq.
- 1 White-necked Crow (*Corvus scapularis*). Purchased.
- 2 Abyssinian Crows (*Corvus affinis*). Purchased.
- 1 Ground-Hornbill (*Bucorvus abyssinicus*). Purchased.
27. 1 Common Otter (*Lutra vulgaris*). Purchased.
- 4 Globose Curassows (*Crax globiceira*). Presented by F. P. Barlee, Esq., C.M.G.
- 1 Little Guan (*Ortalia motmot*). Presented by F. P. Barlee, Esq., C.M.G.
- 1 Pike (*Esox lucius*). Presented by J. Smith, Esq.
- 1 Bream (*Abramis brama*). Presented by J. Smith, Esq.
- 1 Tench (*Tinca vulgaris*). Presented by J. Smith, Esq.
28. 2 Common Peafowl (*Pavo cristata*), ♂ and ♀. Presented by Mrs. Joseph Hoare.
- 1 Mississippi Alligator (*Alligator mississippiensis*). Presented T. L. M. Rose, Esq.
29. 1 Side-striped Jackal (*Canis lateralis*), ♂. Presented by Commander Owen, R.M.S. 'Anglian.'
- 2 Collared Fruit-Bats (*Cynonycteris collaris*). Born in the Menagerie.
- 1 Elate Hornbill (*Buceros elatus*). Purchased.
- 1 Virginian Eagle-Owl (*Bubo virginianus*). Purchased.
30. 2 Bonnet-Monkeys (*Macacus radiatus*), ♂ and ♀. Deposited.
- 1 Common Ocelot (*Felis pardalis*). Presented by A. L. Schütte, Esq.
- 1 Arctic Fox (*Canis lagopus*). Deposited.
- 1 Nylghaie (*Boselaphus pictus*), ♂. Purchased.
- 2 Horrid Rattlesnakes (*Crotalus horridus*). Presented by Messrs. Holt, Lord, & Co.
- 1 Common Trout (*Salmo fario*). Presented by Mr. Stanley Wilson.
31. 1 Collared Peccary (*Dicotyles tajaqu*). Purchased.
- 1 Thick-necked Tree-Boa (*Emicrates cenchris*). Presented by Mr. G. H. Hawtayne, C.M.Z.S.



- Aug. 1. 1 Cayman (*Jacare*, sp. inc.). Deposited.  
 3. 2 Russ's Weaver Birds (*Quelea russi*), ♂ and ♀. Deposited.  
 1 Gaimard's Rat-Kangaroo (*Hypsiprymnus gaimardi*), ♂. Born in the Gardens.  
 1 Anaconda (*Eunectes murinus*). Purchased.  
 10 Barbadian Anolises (*Anolis cepedii*). Purchased.  
 1 Mesopotamian Fallow Deer (*Cercus mesopotamicus*), ♀. Born in the Gardens.  
 4. 2 Swainson's Lorikeets (*Trichoglossus novæ-hollandiæ*). Purchased.  
 4 Brown Capuchins (*Cebus fatuellus*), 2 ♂ and 2 ♀. Purchased.  
 1 Red-handed Tamarin (*Midas rufimanus*), ♂. Purchased. From Surinam.  
 4 Common Sheldrakes (*Tadorna vulpanser*). Purchased.  
 5. 2 Lesser Black-backed Gulls (*Larus fuscus*). Presented by Mr. Beazley.  
 1 Servaline Cat (*Felis servalina*). Purchased.  
 1 Coquetoan Antelope (*Cephalophus rufilatus*), ♂. Purchased.  
 6. 1 Horned Lizard (*Phrynosoma cornutum*). Presented by Mr. Luiz de Tavares Ozorio.  
 7. 1 Azara's Capuchin (*Cebus azaræ*?), ♂. Purchased.  
 9. 4 Richardson's Skuas (*Lestris crepidatus*). Presented by Robert T. C. Scott, Esq. From the Shetland Islands.  
 3 Richardson's Skuas (*Lestris crepidatus*). Deposited. From the Shetland Islands.  
 5 Green Lizards (*Lacerta viridis*). Deposited.  
 1 Common Kingfisher (*Alcedo isipida*). Purchased.  
 1 Areolated Tortoise (*Homopus areolatus*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.  
 1 Geometric Tortoise (*Testudo geometrica*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.  
 10. 1 Northern Buzzard (*Buteo borealis*). Presented by Mr. R. Starling.  
 12. 1 Common Chameleon (*Chameleón vulgaris*). Presented by Percy Howard, Esq.  
 1 Common Squirrel (*Sciurus vulgaris*). Presented by Capt. Tholandir.  
 2 Common Nightjars (*Caprimulgus europæus*). Presented by Mr. E. Ockenden.  
 13. 1 Black-handed Spider Monkey (*Ateles geoffroyi*), ♀. Presented by Capt. Woodward.  
 4 Glass Snakes (*Pseudopus pallasi*). Deposited.  
 1 Yellow-collared Parrakeet (*Platyercus semitorquatus*). Received in exchange.  
 2 Three-ridged Terrapins (*Clemmys trijuga*). Presented by the Hon. L. S. Jackson.  
 2 Hamilton's Terrapins (*Clemmys hamiltoni*). Presented by the Hon. L. S. Jackson.  
 1 Black-necked Hare (*Lepus nigricollis*?). Presented by the Hon. L. S. Jackson.  
 1 Spotted Ichneumon (*Herpestes anropunctatus*). Presented by the Hon. L. S. Jackson.  
 14. 1 Rhesus Monkey (*Macacus erythraus*), ♀. Presented by J. E. Kincaid, Esq.  
 4 Abyssinian Guinea-fowls (*Numida pitlorhyncha*). Presented by Gerald Waller, Esq.

- Aug. 14. 1 Hawk's-billed Turtle (*Chelone imbricata*). Presented by Capt. H. King.
16. 1 Common Jackdaw (*Corvus monedula*). Purchased.  
2 Brown Mynahs (*Acridotheres fuscus*). Purchased.  
1 Gray's Amphispæna (*Lepidosternum grayi*). Presented by W. A. Forbes, Esq., F.Z.S. From Pernambuco.
17. 2 Tcheli Monkeys (*Macacus tcheliensis*), ♂ and ♀. Presented by Dr. Bushell. From Shanghai. See P. Z. S. 1880, p. 537.  
1 Brown Capuchin (*Cebus fatuellus*), ♂. Presented by Percy E. Scrutton, Esq.
18. 1 Spotted Salamander (*Salamandra maculosa*). Presented by Dr. Gibbes, F.Z.S.  
1 Axolotl (*Siredon mexicanus*). Presented by Dr. Gibbes.  
1 Common Tench (*Tinca vulgaris*). Presented by Dr. Gibbes.
19. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by H. G. Wainwright, Esq.  
1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Cecil Peele, Esq.  
2 Moor Macaques (*Macacus maurus*). Purchased.  
1 Straw-necked Ibis (*Carphibis spinicollis*). Purchased.  
1 Maned Goose (*Bernicla jubata*). Purchased.  
1 West-Indian Agouti (*Dasyprocta cristata*). Presented by W. H. Braithwaite, Esq.  
1 Common Cormorant (*Phalacrocorax carbo*). Deposited.  
1 Elate Hornbill (*Buceros elatus*). Purchased.
21. 1 Collared Fruit-Bat (*Cynonycteris collaris*). Purchased.  
1 Electric Silurus (*Malapterurus beninensis*). Purchased.
23. 2 Olive Finches (*Phonipara olivacea*), 2 ♀. Purchased.  
2 American Moorhens (*Gallinula galeata*). Presented by G. H. Hawtayne, Esq., C.M.Z.S.
24. 1 Turnstone (*Streptilas interpres*). Presented by Captain A. M'Ritchie, s.s. 'Utopia.' Captured at sea off the Azores.
25. 1 Nylghaie (*Boselaphus pictus*), ♀. Purchased.  
1 Harnessed Antelope (*Tragelaphus scriptus*), ♀. Purchased.  
1 Michie's Tufted Deer (*Elaphodus michianus*), ♂. Purchased. See P. Z. S. 1880, p. 538.  
1 Syrian Fennec Fox (*Canis famelicus*). Purchased.
26. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by George G. Turner, Esq.  
2 Koodoos (*Strepsiceros kudu*), ♂ and ♀. Purchased. See P. Z. S. 1880, p. 538.  
1 Red-billed Toucan (*Ramphastos erythrorhynchus*). Purchased.
31. 1 Common Squirrel (*Sciurus vulgaris*). Deposited.  
1 Gold Pheasant (*Thaumalea picta*), ♂. Presented by James M'Gregor, Esq.
- Sept. 1. 1 Bonnet Monkey (*Macacus radiatus*), ♂. Presented by C. Kerry Nicholls, Esq.  
1 Common Fox (*Canis vulpes*). Presented by E. Schweder, Esq.  
1 Weka Rail (*Ocydromus australis*). Presented by H. Frank Rose, Esq.  
2. 1 Gannet (*Sula bassana*). Presented by George Edson, Esq.  
3. 1 Boatbills (*Cancroma cochlearia*). Purchased.  
1 White-lipped Peccary (*Dicotyles labiatus*), ♂. Purchased.  
1 Louisianian Heron (*Ardea ludoviciana*). Purchased.  
6 Mocking-birds (*Mimus polyglottus*). Presented by Mr. W. Cross.

- Sept. 3. 1 Hybrid Mesopotamian Fallow Deer (between *Cervus dama* ♀ and *C. mesopotamicus* ♂), ♀. Born in the Gardens.
4. 1 Brazilian Cariama (*Cariama cristata*). Presented by Charles Stanley Barnes, Esq.
6. 1 Rufescent Snake (*Leptodira rufescens*). Presented by the Rev. G. H. R. Fisk, C.M.Z.S.
7. 1 Horned Lizard (*Phrynosoma cornutum*). Presented by Mrs. Budgett.
8. 1 Cuckoo (*Cuculus canorus*). Presented by G. Chandle, Esq.
- 1 Stock-Dove (*Columbaenas*). Presented by A. B. Brooke, Esq.
9. 1 Vervet Monkey (*Cercopithecusalandii*), ♀. Deposited.
- 2 Bull-Frogs (*Rana mugiens*). Deposited.
10. 1 Common Raven (*Corvus corax*). Presented by A. W. Mitchison, Esq.
13. 1 Reeve's Muntjac (*Cervulusreevesi*), ♂. Born in the Menagerie.
- 1 Long-headed Snake (*Xenodon rhabdocephalus*). Presented by Dr. A. Stradling, C.M.Z.S.
- 1 Pointed Tree-Snake (*Dryiophis acuminata*). Presented by Dr. A. Stradling, C.M.Z.S.
- 1 White Amphisbæna (*Amphisbæna alba*). Presented by Dr. A. Stradling, C.M.Z.S.
- 1 Weeper Capuchin (*Cebus capucinus*), ♂. Purchased.
- 1 Ring-tailed Coati (*Nasua rufa*). Purchased.
- 1 Saturnine Mocking-bird (*Mimus saturninus*). Purchased.
- 2 Silky Hangnests (*Amblyrhynchus holosericeus*). Purchased.
- 1 Sulphury Tyrant-bird (*Pitangus sulphuratus*). Purchased.
- 1 Maximilian's Aracari (*Pteroglossus wiedi*). Purchased.
- 1 Brazilian Amphisbæna (*Bronia brasiliensis*). Presented by W. A. Forbes, Esq., F.Z.S. From Parahyba do Norte.
14. 1 Common Cuckoo (*Cuculus canorus*). Presented by E. G. Forbes Higginson, Esq.
- 5 Ruffs (*Macalotes pugnax*). Purchased.
16. 1 Crab-eating Raccoon (*Procyon cancrivorus*), ♀. Purchased.
17. 1 Brown-necked Parrot (*Psecephalus fuscicollis*). Presented by H. Wood, Esq.
18. 1 Spotted Cavy (*Cælogenys paca*). Purchased.
20. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Major Gape.
21. 1 Southern River-Hog (*Potamocharus africanus*). Purchased.
- 1 Jerboa (*Dipus ægyptius*). Presented by Dr. Hastings.
22. 1 Nightingale (*Daulius lusciniæ*). Purchased.
23. 1 Common Squirrel (*Sciurus vulgaris*). Deposited.
- 1 Cape Bucephalus (*Bucephalus capensis*). Presented by C. B. Pillans, Esq.
24. 2 Black-faced Spider Monkeys (*Ateles ater*), 2 ♀. Purchased.
- 1 Razor-billed Curassow (*Mitua tuberosa*). Deposited.
- 1 Yarrell's Curassow (*Crax carunculata*), ♀. Deposited.
- 1 Rufous Tinamous (*Rhyphotus rufescens*). Deposited.
- 1 Blue-and-yellow Macaw (*Ara ararauna*). Deposited.
- 2 Orinoco Geese (*Chenatoper jubata*). Deposited.
- 2 Polish Swans (*Cygnus olor*, var. *immutabilis*). Presented by J. H. Gurney, Esq., F.Z.S.
25. 1 Common Rhea (*Rhea americana*). Purchased.
- 1 Spotted-billed Toucanet (*Selenidera maculirostris*). Purchased.
- 1 Electric Silurus (*Malapterurus beninensis*). Purchased.
27. 1 Purple-faced Monkey (*Semnopithecus leucopymnus*), ♂. Presented by Wm. Collingwood, Esq.
- 1 Rose-Hill Broadtail (*Platycercus eximius*). Presented by Charles Porter, Esq.

- Sept. 28. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by Henry J. Thimbleby, Esq.  
 1 Python (*Python sebae*). Presented by Dr. F. Speer.  
 1 Sulphur-breasted Toucan (*Ramphastos carinatus*). Purchased.
29. 1 Prince Albert's Curassow (*Craz alberti*), ♀. Purchased.  
 2 Common Cranes (*Grus cinerea*). Presented by Norman W. Shairp, Esq. From Lula, Sweden.
30. 1 Common Chameleon (*Chameleon vulgaris*). Presented by Percy Day, Esq.
- Oct. 1. 2 Mandarin Ducks (*Aix galericulata*). Purchased.  
 2. 1 Gerbille (*Gerbillus*, sp. inc.). From Upper Nubia. Presented by Count Rembielinski.  
 3. 1 White-cheeked Capuchin (*Cebus lunatus*), ♂. Presented by Henry Ch. Marckman de Lichtabell, Esq.  
 4. 2 Gayals (*Bibos frontalis*), ♂ and ♀. Received in exchange from the Zoological Gardens, Calcutta. See P. Z. S. 1880, p. 538.  
 1 Indian Crocodile (*Crocodilus palustris*). Received in exchange from the Zoological Gardens, Calcutta.  
 2 Indian Porcupines (*Hystrix cristata*). Presented by Capt. Smerdon.  
 1 Greater Spotted Woodpecker (*Picus major*). Purchased.
5. 2 Central-American Agoutis (*Dasyprocta isthmica*). Deposited.  
 1 Variable Squirrel (*Sciurus variabilis*). Deposited.  
 1 Plantain-Squirrel (*Sciurus plantani*). Presented by D. Tober, Esq.  
 1 Common Spoonbill (*Platalea leucorodia*). Presented by W. H. St. Quintin, Esq.  
 1 European Pond-Tortoise (*Emys europæa*). Deposited.  
 2 Adorned Terrapins (*Clemmys ornata*). Deposited.  
 1 Speckled Terrapin (*Clemmys guttata*). Deposited.  
 1 Pennsylvanian Mud-Terrapin (*Cinosternon pennsylvanicum*). Deposited.  
 2 Scorpion Mud-Terrapins (*Cinosternon scorpioides*). Deposited.  
 3 Moorish Geckos (*Platydictylus mauritanicus*). Deposited.  
 2 Glass-Snakes (*Pseudopus pallasi*). Deposited.  
 1 Lacertine Snake (*Cælopettis lacertina*). Deposited.  
 1 Common Snake (*Tropidonotus natrix*, var.). Deposited.
6. 1 Fraser's Squirrel (*Sciurus stramineus*). Purchased.  
 1 Ring-tailed Coati (*Nasua rufa*). Purchased.  
 3 Californian Quails (*Callipepla californica*), ♂ and ♀. Purchased.  
 1 Cayenne Lapwing (*Vanelhus cayennensis*). Purchased.  
 1 Smooth Snake (*Coronella levis*). Presented by D. Tober, Esq. From Hampshire.  
 2 West-African Pythons (*Python sebae*). Deposited.  
 1 Common Boa (*Boa constrictor*). Deposited.
8. 1 Common Kestrel (*Tinnunculus alaudarius*). Presented by J. Young, Esq.
9. 1 Plantain Squirrel (*Sciurus plantani*). Presented by Mrs. Elliott.
11. 1 Bonnet-Monkey (*Macacus radiatus*), ♂. Deposited.  
 1 Yellow-footed Rock-Kangaroo (*Petrogale xanthopus*), ♂. Born in the Menagerie.
12. 1 Ring-Ouzel (*Turdus torquatus*). Purchased.
13. 1 Rock-Cavy (*Cerodon rupestris*). Purchased.  
 1 Green-winged Trumpeter (*Psophia viridis*). Purchased.  
 1 White-bellied Parrot (*Caica leucogastra*). Purchased.

- Oct. 13. 1 Red-vented Parrot (*Pionus menstruus*). Purchased.  
 2 Golden-headed Parakeets (*Protophygia tui*). Purchased.  
 2 Toco Toucans (*Ramphastos toco*). Purchased.  
 1 Orinoco Goose (*Chenalope jubata*), ♂. Purchased.  
 2 Orchard Hangnests (*Icterus spurius*). Purchased.  
 1 Baltimore Hangnest (*Icterus baltimore*). Purchased.  
 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by W. B. Tustin, Esq.  
 1 Black Iguana (*Metopoceros cornutus*). Purchased.  
 1 Common Chameleon (*Chameleo vulgaris*). Purchased.
14. 1 Crested Porcupine (*Hystrix cristata*). Presented by W. Middleton, Esq.  
 3 Gaimard's Rat-Kangaroos (*Hypsiprymnus gaimardi*), 2 ♂ and 1 ♀. Presented by A. B. Gow, Esq.  
 1 Herring-Gull (*Larus argentatus*). Presented by Mr. J. Palmer.  
 1 Sun-Bittern (*Eurostygia helius*). Deposited.  
 1 Centipede. Presented by Mr. H. Keep.
16. 2 Squirrel-like Phalangers (*Belideus sciureus*). Born in the Menagerie.  
 2 Polar Bears (*Ursus maritimus*). Presented by B. Leigh Smith, Esq., F.Z.S. See P. Z. S. 1880, p. 538.  
 1 Ivory Gull (*Larus churruis*). Presented by B. Leigh Smith, Esq., F.Z.S. See P. Z. S. 1880, p. 538.  
 1 Red Brocket (*Caracus rufus*). Presented by W. A. Forbes, Esq., F.Z.S. From Pernambuco.  
 1 White-bellied Opossum (*Didelphys albiventris*). Presented by W. A. Forbes, Esq., F.Z.S. From Pernambuco.  
 1 Brazilian Hare (*Lepus brasiliensis*). Presented by W. A. Forbes, Esq., F.Z.S. From Pernambuco.  
 1 White-bellied Guan (*Ortalis albiventris*). Presented by W. A. Forbes, Esq., F.Z.S. From Pernambuco.  
 1 Frigate-bird (*Fregata aquila*). Presented by the Rev. G. Bayldon. From Fernando de Noronha.  
 2 American Black-backed Geese (*Sarcidioris carunculata*), ♂ and ♀. Presented by Miss Davis. From Pernambuco.  
 1 Yellow-headed Conure (*Conurus jendaya*). Presented by C. A. Craven, Esq. From Pernambuco.  
 1 White-throated Finch (*Spermophila albogularis*). Presented by Mr. S. Jones. From Pernambuco.  
 1 Horrid Rattlesnake (*Crotalus horridus*). Presented by H. E. Weaver, Esq. From Pernambuco.  
 1 Rufous Pigeon (*Columba rufina*). Purchased. From Parahyba.  
 3 Picazuro Pigeons (*Columba picazuro*). Purchased. From Pernambuco.  
 1 White-eyebrowed Guan (*Penelope superciliaris*). Purchased. From Panellas, Brazil.  
 4 Brown-throated Conures (*Conurus ceruginosus*). Purchased. From Garanhuns, Brazil.  
 2 Banded Tinamous (*Crypturus noctivagus*). Purchased. From Garanhuns, Brazil.  
 7 Tataupa Tinamous (*Crypturus tataupa*). Purchased. From Garanhuns, Brazil.  
 1 Yarrell's Siskin (*Chrysomitris yarrelli*). Purchased. From Parahyba.  
 1 Scarlet Tanager (*Ramphocelus brasilius*). Purchased. From Bahia.  
 1 Black Tanager (*Tachyphonus melaleucus*). Purchased. From Pernambuco.

- Oct. 16. 1 Blue-and-black Tanager (*Calliste brasiliensis*). Purchased. From Bahia.  
 1 Black-headed Tanager (*Orchesticus ater*). Purchased. From Pernambuco.  
 2 Scaly Doves (*Scardafella squamosa*). Purchased. From Paraguayba.  
 1 Passerine Ground-Dove (*Chamæpelis passerina*). Purchased. From Pernambuco.  
 1 Great-billed Rhea (*Rhea macrorhyncha*). Purchased. From Agoas Bellas, Pernambuco.  
 3 Yellow-shouldered Hangnests (*Icterus tibialis*). Purchased. From Pernambuco.  
 1 Black Tortoise (*Testudo carbonaria*). Presented by W. A. Forbes, Esq., F.Z.S. From Garanhuns, Brazil.  
 19. 1 Horned Lizard (*Phrynosoma cornutum*). Presented by W.C. Boyd, Esq.  
 20. 1 Waxwing (*Ampelis garrulus*). Deposited.  
 1 Dunlin (*Tringa cinchus*). Presented by Edmund Elliot, Esq.  
 1. Sanderling (*Calidris arenaria*). Presented by Edmund Elliot, Esq., M.R.C.S.  
 21. 1 Black Saki (*Pithecia satanas*). Purchased.  
 1 Roseate Spoonbill (*Platalea ajaja*). Purchased.  
 1 Great-billed Rhea (*Rhea macrorhyncha*). Purchased.  
 24. 1 Macaque Monkey (*Macacus cynomolgus*). Presented by F. W. Manley, Esq.  
 25. 1 Ornamented Ceratophrys (*Ceratophrys ornata*). Purchased.  
 26. 1 Ursine Dasyure (*Dasyurus ursinus*). Purchased.  
 1 Common Wigeon (*Mareca penelope*). Purchased.  
 1 Grey Plover (*Squatarola helvetica*). Purchased.  
 1 Knot (*Tringa canutus*). Purchased.  
 1 Greenshank (*Totanus calidris*). Purchased.  
 27. 1 Sykes's Monkey (*Cercopithecus albigularis*), ♀. Presented by the Officers of the Royal Yacht.  
 1 Rhesus Monkey (*Macacus erythræus*), ♀. Presented by the Rev. J. Saunders, B.A.  
 1 Two-toed Sloth (*Choloepus didactylus*). Presented by G. H. Hawtayne, Esq., C.M.Z.S. From Demerara.  
 1 Common Trumpeter (*Psophia crepitans*). Presented by J. Stovell, Esq.  
 2 Silver Pheasants (*Euplocamus nycthemerus*), 2 ♂. Presented by Miss C. Hallet.  
 28. 1 Long-eared Owl (*Asio otus*). Purchased.  
 30. 1 Indian Jerboa (*Alactaya indica*). Presented by Major Money. From Afghanistan. See P. Z. S. 1880, p. 539.  
 31. 1 Green Monkey (*Cercopithecus callitrichus*). Presented by Mr. A. Haynes.  
 2 Common Eels (*Anguilla vulgaris*). Purchased.
- Nov. 2. 1 Rhesus Monkey (*Macacus erythræus*), ♂. Presented by Miss Tilbury.  
 1 Moustache Monkey (*Cercopithecus cephus*), ♀. Presented by Charles Atkins, Esq.  
 5 Schlegel's Doves (*Chalcopelia puella*). Purchased.  
 2 Gambian Pouched Rats (*Cricetomys gambianus*). Purchased.  
 3. 1 Jaguar (*Felis onça*), ♂. Presented by Lady Florence Dixie. From Corrientes, S. America.  
 1 Bonnet-Monkey (*Macacus radiatus*), ♀. Presented by Wm. Underwood Harvey, Esq.

Nov. 3. 2 Horned Lizards (*Phrynosoma cornutum*). Presented by Miss Branscom.

- 1 Spanish Terrapin (*Clemmys leprosa*). Deposited.
4. 1 Hocheur Monkey (*Cercopithecus nictitans*). Purchased.
- 2 Indian Fruit-Bats (*Pteropus medius*). Purchased.
- 2 Guira Cuckoos (*Guira piririgua*). Purchased.
- 2 Red-bellied Thrushes (*Turdus rufiventris*). Purchased.
- 1 Bodinus's Amazon (*Chrysotis bodini*). Purchased.
- 4 Blood-breasted Pigeons (*Phlogoenas cruentata*). Purchased.
- 1 Brown-necked Parrot (*Paeocephalus fuscicollis*). Purchased.
- 2 Javan Parrakeets (*Palaeornis javanica*). Purchased.
- 3 Euler's Finches (*Spermophila eulerei*). Purchased.
- 1 Bearded Lizard (*Amphibolurus barbatus*). Purchased.
5. 2 Pampas Deer (*Cariacus campestris*), ♂ and ♀. Purchased.
6. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by M. M. Winchester, Esq.
- 1 Chinese Water-Deer (*Hydropotes inermis*), ♂. Received in exchange.
- 1 Coati (*Nasua rufa*). Presented by H. T. Jones, Esq.
- 2 Gaimard's Rat-Kangaroos (*Hypsiprymnus gaimardi*). Born in the Menagerie.
7. 1 Anubis Baboon (*Cynocephalus anubis*), ♂. Presented by Captain Barrow.
- 1 Collared Mangabey (*Cercocebus collaris*), ♂. Presented by Captain Barrow.
- 1 Griwet Monkey (*Cercopithecus griseoviridis*), ♀. Presented by Captain Barrow.
- 1 Ludio Monkey (*Cercopithecus ludio*). Presented by Captain Barrow.
8. 1 White-winged Chough (*Corcorax leucopterus*). Received in exchange.
- 1 Alligator Terrapin (*Chelydra serpentina*). Presented by J. H. Thomson, Esq., C.M.Z.S.
9. 1 Malbrouck Monkey (*Cercopithecus cynosurus*). Presented by E. A. Evans, Esq.
- 2 Summer Ducks (*Aix sponsa*), ♂ and ♀. Presented by Lord Braybrooke, F.Z.S.
- 1 Herring-Gull (*Larus argentatus*). Presented by J. Forbes Nixon, Esq.
10. 1 Blyth's Pastor (*Pastor blythi*). Presented by Capt. C. S. Sturt, C.M.Z.S.
- 1 Banded Sand-Grouse (*Pterocles fasciatus*). Presented by Capt. C. S. Sturt, C.M.Z.S.
- 1 Herring-Gull (*Larus argentatus*). Presented by Mrs. Lawson.
11. 3 Red-crowned Pigeons (*Erythrænas pulcherrima*). Presented by Lady Bowen.
- 4 Knots (*Tringa canutus*). Purchased.
- 2 Curlews (*Numenius arquata*). Purchased.
- 2 Pink-footed Geese (*Anser brachyrhynchus*). Purchased.
12. 1 Algerian Hedgehog (*Erinaceus algirus*). Presented by Dr. G. E. Dobson, C.M.Z.S.
13. 1 Bonnet Monkey (*Macacus radiatus*), ♀. Presented by Mr. M. Nicholson.
15. 1 Common Gull (*Larus canus*). Presented by G. Herring, Esq.
- 1 Black-headed Gull (*Larus ridibundus*). Purchased.
- 1 Maximilian's Parrot (*Pionus maximiliani*). Purchased.
- 1 White-necked Crow (*Corvus scapularis*). Purchased.
- 1 Silky Hangnest (*Amblyrhampus holosericeus*). Purchased.
- 2 Dark-green Maize-eaters (*Pseudolistes virescens*). Purchased.

- Nov. 15. 1 Annulated Snake (*Leptodira annulata*). Purchased.  
 1 Dekay's Snake (*Isehnognathus dekayi*). Purchased.
16. 2 Moor-Harriers (*Circus maurus*). Purchased.
17. 1 Malbrouck Monkey (*Cercopithecus cynosurus*), ♂. Presented by Wm. Behrens, Esq.  
 2 Bearded Tits (*Panurus biarmicus*), ♂ and ♀. Presented by J. Young, Esq., F.Z.S.
18. 2 Mantchurian Crossoptilons (*Crossoptilon mantchuricum*), 2 ♀. Received in exchange.  
 2 Hardwicke's Mastigures (*Uromastix hardwickii*). Presented by Mr. Wm. Jamrach.  
 2 Ruddy-headed Geese (*Bernicla rubidiceps*), ♂ and ♀. Purchased.
19. 1 Patas Monkey (*Cercopithecus ruber*), ♀. Presented by Dr. Horlock.  
 1 Viviparous Lizard (*Lacerta vivipara*). Presented by Miss Flora Russell.  
 1 Sand-Lizard (*Lacerta agilis*). Presented by Miss Flora Russell.  
 1 Ring-Ouzel (*Turdus torquatus*). Purchased.
20. 1 Philantomba Antelope (*Cephalophus maxwelli*?), ♀. Presented by G. P. Henderson, Esq., Lieut. R.N.  
 6 Common Dormice (*Muscardinus avellanarius*). Purchased.  
 1 Silver Fox (*Canis fulvus*, var. *argentata*). Presented by Edward Harris, Esq., F.L.S. From Hudson's Bay.  
 1 Golden Eagle (*Aquila chrysaetos*). Presented by Edward Harris, Esq., F.L.S. From Hudson's Bay.
22. 1 American Tantalus (*Tantalus loculator*). Purchased.
25. 1 Molucca Deer (*Cervus moluccensis*), ♀. Born in the Menagerie.
26. 2 Matamata Terrapins (*Chelys matamata*). Purchased. See P. Z. S. 1880, p. 648.  
 3 Indian Cobras (*Naja tripudians*). Purchased.
27. 3 Crested Tits (*Parus cristatus*). Purchased.
29. 1 Uniform Water-Snake (*Fordonia unicolor*). Purchased. See P. Z. S. 1880, p. 648.
30. 1 Central-American Agouti (*Dasyprocta isthmica*). Presented by Mr. H. B. Whitmarsh.  
 1 Prince Albert's Curassow (*Crax alberti*), ♀. Purchased.  
 1 Rufous-vented Guan (*Penelope cristata*). Purchased.
- Dec. 1. 1 Hawk's-billed Turtle (*Chelone imbricata*). Presented by J. F. Williams, Esq.  
 1 Paradise Whydah Bird (*Vidua paradisæa*), ♂. Received in exchange.
2. 1 Common Hare (*Lepus europæus*). Presented by Mrs. G. Ringrove.
3. 9 Dunlins (*Tringa cinclus*). Purchased.  
 6 Knots (*Tringa canutus*). Purchased.  
 1 Golden Plover (*Charadrius phivalis*). Purchased.  
 1 Common Lapwing (*Vanellus cristatus*). Purchased.  
 2 Redshanks (*Totanus calidris*). Purchased.  
 1 Bar-tailed Godwit (*Limosa lapponica*). Purchased.  
 1 Oystercatcher (*Hæmatopus ostralegus*). Purchased.  
 2 Black-headed Gulls (*Larus ridibundus*). Purchased.  
 1 Goosander (*Mergus merganser*). Purchased.  
 1 Razorbill (*Alca torda*). Purchased.
4. 1 Hog-Deer (*Cervus porcinus*), ♀. Presented by Lord Ilchester.



- Dec. 4. 3 Madagascar Porphyrios (*Porphyrio madagascariensis*). From Madagascar. Presented by Messrs. Hugh Low & Co.
6. 1 Red Wolf (*Canis jubatus*), ♀. Presented by Mr. W. Petty. From Buenos Ayres. See P. Z. S. 1881, p. 165.
- 2 Grey-breasted Parrakeets (*Bolborhynchus monachus*). Purchased.
7. 1 Ring-tailed Coati (*Nasua rufa*). Presented by J. Hallawell, Esq.
- 1 Yellow-cheeked Amazon (*Chrysotis autumnalis*). Presented by Captain Henniker, F.Z.S.
8. 1 Goosander (*Mergus merganser*), ♂. Purchased.
- 1 Dwarf Chameleon (*Chamaeleon pumilis*). Presented by Dr. Reid.
9. 1 Malbrouck Monkey (*Cercopithecus cynosurus*). Presented by J. E. Saunders, Esq.
10. 1 Egyptian Ichneumon (*Herpestes ichneumon*). Presented by Mrs. Elizabeth Hooker.
- 1 Cape Eagle-Owl (*Bubo capensis*). Presented by V. A. Litkie, Esq. From Griqualand West.
- 1 American Mocking-bird (*Mimus polyglottus*). Deposited.
- 21 Seven-banded Snakes (*Tropidonotus leberis*). Born in the Menagerie.
11. 1 Papuan Pig (*Sus papuensis*). Presented by Lieut. De Hoghton, H.M.S. 'Beagle.' From Brooker Island, Louisiade Archipelago. See P. Z. S. 1881, p. 165.
- 1 Black Wallaby (*Halmaturus ualabatus*), ♀. Presented by Commander C. E. Gissing, R.N.
13. 1 Red-throated Diver (*Colymbus septentrionalis*). Purchased.
13. 2 Lovebirds (*Agapornis pullaria*), ♂ and ♀. Purchased.
15. 1 Sumatran Civet (*Viverra tangalunga*). Presented by W. B. Pryer, Esq., C.M.Z.S.
- 1 Blood-breasted Pigeon (*Phlogoenas cruentata*). Presented by Messrs. Hugh Low & Co.
16. 1 Long-nosed Crocodile (*Crocodilus cataphractus*). Presented by Surgeon F. Speer.
17. 1 Black Rat (*Mus rattus*). Presented by E. Worssam, Esq.
18. 1 Roseate Cockatoo (*Cacatua roseicapilla*). Presented by H. Dumbell, Esq.
- 4 Blue-crowned Hanging Parrakeets (*Loriculus galgulus*). Purchased.
- 1 Common Jackdaw (*Corvus monedula*). Purchased.
- 1 American Darter (*Plotus ankinga*). S. America. Purchased.
20. 1 Gaimard's Rat-Kangaroo (*Hypsiprymnus gaimardi*), ♀. Purchased.
21. 1 Hawfinch (*Coccothraustes vulgaris*). Purchased.
23. 1 Banded Parrakeet (*Palæornis fasciatus*), ♂. Deposited.
24. 1 Variegated Sheldrake (*Tadorna variegata*), ♂. Received in exchange.
25. 2 Greater White-crested Cockatoos (*Cacatua cristata*). Deposited.
30. 1 Black-eared Marmoset (*Hapale penicillata*). Presented by J. Morison, Esq., F.Z.S.
- 3 Egyptian Geese (*Chenalopex ægyptiaca*), 3 ♂. Deposited.
- 2 Swainson's Lorikeets (*Trichoglossus novæ hollandiæ*). Purchased.
- 2 Chattering Lories (*Lorius garrulus*). Purchased.
- 2 Blue-streaked Lories (*Eos reticulata*). Purchased.
- 2 Red Lories (*Eos rubra*). Purchased.
- 4 Purple-capped Lories (*Lorius domicella*). Purchased.

# INDEX.

- Acanthodactylus*  
*micropholis*, 620, 621.  
*Acantholipes*  
*affinis*, 677.  
*inconspicua*, 677.  
*nigrisigna*, 677.  
*Accipiter*  
*bicolor*, 211.  
*erythrocnemis*, 211.  
*pectoralis*, 155.  
*stevensoni*, 14.  
*Achæa*  
*cyllaria*, 678.  
*fusifera*, 678.  
*melicerte*, 679.  
*polychroma*, 678.  
*signivitta*, 678.  
*Achatina*  
*dimidiata*, 616.  
*heuglini*, 345.  
*kirkii*, 218, 219.  
*mamillata*, 215, 219.  
*nilotica*, 345.  
*smithii*, 617, 619.  
*transvaalensis*, 616.  
*(Limicolaria)*, *martensiana*, 345, 352.  
*(—)* *rectistrigata*, 346, 352.  
*Achlyodes*  
*vasava*, 152.  
*Acidalia*  
*eulomata*, 687.  
*nesciaria*, 687.  
*perlineata*, 687.  
*repletaria*, 687.  
*Acme*  
*emaciata*, 137, 142.  
*folimiana*, 94, 136, 137, 138, 142.  
*mentoni*, 138.  
*pachystoma*, 137, 142.  
*Acontia*  
*maculosa*, 677.  
*meridionalis*, 677.  
*Acræa*  
*buatoni*, 185.  
*chilo*, 184, 185.  
*horta*, 184.  
*insignis*, 184, 185.  
*Acridothères*  
*tristis*, 311.  
*Actitis*  
*incana*, 576.  
*Actiturus*  
*bartramius*, 543.  
*Adamastor*  
*cinereus*, 164.  
*Adela*  
*albicornis*, 77, 78.  
*bella*, 78, 79.  
*bellela*, 77, 78, 79.  
*biviella*, 77, 78, 79.  
*chalybeis*, 78, 79.  
*degeerella*, 78.  
*fasciella*, 78, 79.  
*flammensella*, 78, 79.  
*gemmella*, 81, 92.  
*griseella*, 82, 92.  
*iochroa*, 79.  
*lactimaculella*, 80, 92.  
*natalensis*, 78.  
*orientella*, 82.  
*purpurea*, 77, 79.  
*ridingsella*, 78, 79.  
*rufimetrella*, 81.  
*schlageri*, 78, 79.  
*septentrionella*, 79, 92.  
*simpliciella*, 81, 92.  
*singulella*, 80, 92.  
*sulzella*, 80.  
*trifasciella*, 78.  
*trigrapha*, 78, 79, 92.  
*violella*, 81.  
*(Dicte)* *coruscifasciella*, 79.  
*(Nomotois)* *trifasciella*, 78, 79.  
*Adelomyia*  
*melanogenys*, 207.  
*Adeorbis*  
*angasi*, 417.  
*vincentiana*, 417, 420.  
*Ægialitis*  
*curonica*, 38, 39.  
*jerdoni*, 39.  
*minuta*, 38.  
*Ægoceros*  
*musimon*, 59.  
*Ætheria*  
*elliptica*, 345, 352.  
*Agama*  
*agilis*, 620.  
*Agamura*  
*cruralis*, 620, 621.  
*Agathomerus*  
*simplicipennis*, 590, 608.  
*Agelæus*  
*phæniceus*, 311.  
*Aglæactis*  
*cupreipennis*, 207.  
*parvula*, 207, 208.  
*Aix*  
*galericulata*, 513.  
*sponsa*, 518, 513.  
*Alactaga*  
*decumana*, 64.  
*indica*, 538.  
*Alata*  
*anticalis*, 689.  
*Alauda*  
*chuana*, 491.  
*Alcelaphus*  
*bubalis*, 307.  
*Aletia*  
*formosana*, 675.  
*Alytes*  
*obstetricans*, 563.  
*Amauropsis*  
*globulus*, 416, 420.  
*Amaurornis*  
*moluccana*, 65.  
*Amazilia*  
*leucophaea*, 208.

Ambassiss  
   *nama*, 230.  
 Amblygoes  
   *evulsalis*, 681.  
 Amblypneustes  
   *formosus*, 437, 438, 439.  
   *griseus*, 436, 437, 440.  
   *pallidus*, 437, 438, 439.  
   *pentagonus*, 435.  
 Amerila  
   *rhodopa*, 670.  
 Ampullaria  
   *kordofana*, 348.  
   *ovata*, 345, 348.  
 Anæretes  
   *parulus*, 202.  
 Analcipus  
   *cruentus*, 15.  
 Anas  
   *angustirostris*, 520.  
   *bernieri*, 519, 534.  
   *boschas*, 515, 516, 517,  
     534.  
   *capensis*, 526.  
   *castanea*, 518, 519,  
     535.  
   *chlorotis*, 519, 535.  
   *cristata*, 519.  
   *erythrorhyncha*, 515.  
   *flavirostris*, 518.  
   *formosa*, 521.  
   *gibberifrons*, 452, 519,  
     534, 535.  
   *girra*, 505.  
   *gracilis*, 519.  
   *jubata*, 499.  
   *luzonica*, 517, 534.  
   *melleri*, 517, 534.  
   *nævosa*, 513.  
   *obscura*, 517.  
   *peposaca*, 524.  
   *perpulchra*, 521.  
   *pæclorhyncha*, 518,  
     534.  
   *punctata*, 451, 518,  
     522.  
   *scutulata*, 512.  
   *sparsa*, 518, 534.  
   *specularis*, 519.  
   *superciliaris*, 517, 535.  
   *wywilliana*, 517, 535.  
   *xanthorhyncha*, 518,  
     534.  
   *zonorhyncha*, 518, 534.  
 Anatina  
   *brevis*, 580.  
   *crassa*, 581.  
   *ovalis*, 581.  
   *pandoriformis*, 581.  
 Ancylus  
   *caffer*, 617, 618.

Ancylus  
   *transvaalensis*, 617, 618,  
     619.  
 Anesychia  
   *cirrhocnemis*, 88.  
   *multipunctella*, 85.  
   *sparsicella*, 85.  
   *sparsiciliella*, 85.  
   *hagenella*, 85, 88.  
 Anolis  
   *bouvieri*, 491.  
   *buckleyi*, 492.  
   *chrysoplepis*, 491.  
   *nasicus*, 491, 492, 493.  
   *nummifer*, 491.  
   *pentapryon*, 491.  
   *scyphaeus*, 491.  
   *viridianeus*, 491.  
   *vittigerus*, 491.  
   (Rhinosaurus) *nasicus*,  
     493.  
 Anophia  
   *acronyctoides*, 679.  
 Anostostoma  
   *alatum*, 152, 153.  
   *cuniculator*, 152,  
     153.  
 Anous  
   *melanogenys*, 577.  
   *stolidus*, 577.  
 Anser  
   *albatus*, 501.  
   *albifrons*, 500, 534.  
   *brachyrhynchus*, 317,  
     500.  
   *cærulescens*, 501.  
   *canagicus*, 501.  
   *cinereus*, 499.  
   *cygnoides*, 501.  
   *erythropus*, 317, 500.  
   *ferus*, 499.  
   *gambeli*, 500.  
   *grandis*, 500, 501.  
   *hyperboreus*, 501.  
   *indicus*, 500.  
   *jubatus*, 499.  
   *melanopterus*, 504.  
   *middendorfi*, 500.  
   *minutus*, 500.  
   *rossi*, 501.  
   *segetum*, 317, 500.  
   *skormiakooi*, 500.  
 Anseranas  
   *melanoleuca*, 497, 535.  
 Antechinomys  
   *laniger*, 187.  
 Antechinus  
   *swainsoni*, 459.  
   *roseus*, 426.  
 Anthracoceros  
   *malayanus*, 14.

Anthropoides  
   *virgo*, 315.  
 Anthropolithecus  
   *trogodytes*, 301.  
 Anthus  
   *bogotensis*, 191.  
 Antigonus  
   *vasava*, 152.  
 Antilocapra  
   *americana*, 22,  
     540.  
 Antilope  
   *redunca*, 307.  
 Apendala  
   *conspecta*, 673.  
 Apopetres  
   *phantasma*, 414.  
 Apphadana  
   *evulsalis*, 681.  
 Appias  
   *formosana*, 669.  
 Apurina  
   *bipunctifera*, 690.  
   *gratiosella*, 690.  
 Apus  
   *dukianus*, 392.  
 Aquila  
   *chrysaetos*, 308.  
 Ara  
   *ararauna*, 310.  
   *chloroptera*, 310.  
   *macao*, 310.  
   *maracana*, 310.  
 Arctomys  
   *sp. inc.*, 60.  
   *bobac*, 454.  
   *caudatus*, 453.  
   *hemachalanus*, 453,  
     454.  
   *himalayanus*, 453.  
   *hodgsoni*, 453, 454.  
   *marmotta*, 305.  
   *robustus*, 453.  
   *tibetanus*, 453, 454.  
 Ardea  
   *atricapilla*, 39, 40.  
   *chrysopelargus*, 94.  
   *garzettii*, 316.  
   *javanica*, 39.  
   *rutenbergi*, 39, 40.  
   *sacra*, 577.  
   *scapularis*, 39.  
   *sinensis*, 577.  
   *virescens*, 39.  
 Ardetta  
   *cinnamomea*, 15.  
 Argyrodes  
   *abscissa*, 328, 342,  
     343.  
   *affinis*, 336, 337, 342,  
     343.

- Argyrodus*  
*amboinensis*, 331, 332, 342, 343.  
*amplifrons*, 335, 337, 339, 342, 344.  
*antipodiana*, 327.  
*argentata*, 325, 327, 342, 343.  
*bicornis*, 334, 342, 343.  
*cognata*, 326.  
*concinna*, 322, 342, 343.  
*epiræ*, 321, 322, 323, 325, 327, 328, 336, 343.  
*felix*, 340, 342, 344.  
*fissifrons*, 329, 330, 331, 342, 343.  
*flavescens*, 321, 342, 343.  
*infelix*, 340, 342, 344.  
*inguinalis*, 329, 330, 331, 342, 343.  
*jacunda*, 326, 342, 343.  
*lugens*, 323, 327, 342, 343.  
*minax*, 336, 337, 342, 343.  
*nasuta*, 333, 342, 343.  
*nephilæ*, 324, 325, 326, 342, 343.  
*nigra*, 341, 342, 344.  
*obtusa*, 335, 337, 338, 339, 342, 344.  
*procrastinans*, 329, 330, 342, 343.  
*rostrata*, 325, 342, 343.  
*samoensis*, 323, 342, 343.  
*scintillulana*, 320, 332, 343.  
*sextuberculata*, 335, 342, 344.  
*ululans*, 336, 337, 339, 342, 344.
- Arion*  
*austeniatus*, 108.  
*hortensis*, 108.  
*rufus*, 290, 296.
- Arremon*  
*nigriceps*, 196.
- Arrenga*  
*melanura*, 16.
- Artaxa*  
*varians*, 673.
- Artibeus*  
*planirostris*, 465.  
*quadrivittatus*, 465.  
 (Uroderma) *bilobatus*, 396.
- Arvicola*  
*arvalis*, 63, 64.  
*guentheri*, 62, 63.  
*leucura*, 62, 64.  
*micrurus*, 62.  
*mystacinus*, 62.  
*nivalis*, 64.  
*socialis*, 62.  
*stoliczkanus*, 64.  
*syriacus*, 62.
- Asopia*  
*decoloralis*, 682.  
*hipponalis*, 683.  
*iolealis*, 683.  
*lydialis*, 682.  
*ornatalis*, 683.  
*rufipicta*, 682.  
*vulgalis*, 682.
- Asphæra*  
*basalis*, 601, 609.  
*decemmaculata*, 602, 609.  
*tomentosa*, 601, 609.
- Aspicela*  
*albomarginata*, 600, 609.  
*discoidalis*, 600, 609.  
*rugosa*, 600, 609.  
*cretacea*, 600, 609.
- Assara*  
*albicostalis*, 639.
- Astroides*  
*calicularis*, 27.
- Astur*  
*macrocelides*, 621.
- Ateles*  
*ater*, 302.  
*geoffroyi*, 634.  
*paniscus*, 642.
- Atelornis*  
*crossleyi*, 468, 472.
- Athene*  
*noctua*, 309.
- Atteva*  
*niveigutta*, 690.
- Atticora*  
*cyanoleuca*, 192.
- Aulocera*  
*brahminus*, 147.  
*werang*, 147.
- Austenia*  
*cinerea*, 298.  
*gigas*, 294, 298, 299.  
*minuta*, 298.  
*resplendens*, 298.  
*salia*, 298.  
*solida*, 298.  
*venusta*, 298.
- Australica*  
*violacea*, 171, 182.
- Automolus*  
*dorsalis*, 158.  
*pallidigularis*, 158.
- Azece*  
*tridens*, 665.
- Azinis*  
*hilarella*, 691.
- Badera*  
*prodigilla*, 687.
- Balenoptera*  
*rostrata*, 358.
- Balearica*  
*chrysopelargus*, 94.  
*pavonica*, 93.  
*pavonina*, 316.  
*regulorum*, 93, 94, 316.
- Barbus*  
*canius*, 225.  
*diplocheilus*, 226.  
*gelius*, 225.  
*milesi*, 225, 228, 231.  
*sarana*, 230.  
*terio*, 225, 229, 231.  
*ticto*, 230.  
*tor*, 225, 228, 230, 231.
- Barilius*  
*vagra*, 230.
- Basileuterus*  
*nigricristatus*, 191.  
*trifasciatus*, 191.
- Bassaricyon*  
*alleni*, 393, 397, 398, 399.  
*gabbi*, 397, 398, 399.
- Belenois*  
*mesentina*, 409, 415.
- Berardius*  
*arnouxi*, 237.
- Bernicla*  
*antarctica*, 504.  
*brenta*, 317, 502, 534.  
*canadensis*, 317, 501, 502.  
*cyanoptera*, 502, 534.  
*dispar*, 503.  
*hutchinsi*, 502.  
*inornata*, 503.  
*jubata*, 499, 504, 535.  
*leucopstis*, 317, 500, 501.  
*magellanica*, 502, 503.  
*melanopectera*, 504.  
*nigricans*, 502.  
*poliocephala*, 503.  
*rubidiceps*, 503.  
*ruficollis*, 502.  
*sandvicensis*, 504, 535.

- Bessonornis  
   *humeralis*, 490.  
 Blhringa  
   *remifer*, 14.  
 Bibos  
   *frontalis*, 538.  
 Bison  
   *americanus*, 308.  
 Biziura  
   *lobata*, 529, 535.  
 Boarmia  
   *inconclusa*, 686.  
 Dolborhynchus  
   *aurifrons*, 211.  
   *monachus*, 310.  
 Boselaphus  
   *pictus*, 307.  
 Botia  
   *geto*, 220, 231.  
 Botys  
   *coclesalis*, 685.  
   *damoalis*, 685.  
   *egenalis*, 683.  
   *iolealis*, 683.  
   *pruinialis*, 686.  
   *stultalis*, 685.  
   *thysalis*, 686.  
   *tropicalis*, 685.  
 Brachyurus  
   *calvus*, 638, 646, 647.  
   *israelita*, 644, 645.  
   *melanocephalus*, 638,  
     645.  
   *ouakari*, 644, 645.  
   *rubicundus*, 627, 634,  
     635, 636, 638, 641,  
     644, 646, 647.  
 Bradypus  
   *infuscatus*, 402.  
 Branta  
   *rufina*, 524.  
 Brissus  
   *carinatus*, 34.  
   *unicolor*, 34.  
 Buarremion  
   *assimilis*, 196, 197,  
     198.  
   *brunneinucha*, 197,  
     198.  
   *chrysopogon*, 198.  
   *inornatus*, 198.  
   *latinuchus*, 197.  
   *taczanowski*, 197.  
   *torquatus*, 197, 198.  
   *tricolor*, 197.  
   *virenticeps*, 198.  
 Bubalornis  
   *niger*, 491.  
 Bubo  
   *magellanicus*, 211.  
   *maximus*, 309.  
   *virginianus*, 211, 309.  
 Bubuleus  
   *coromandus*, 15.  
 Bucephala  
   *albicola*, 527.  
 Bucorvus  
   *abyssinicus*, 313.  
 Bufo  
   *agua*, 559.  
   *angusticeps*, 546, 547,  
     564, 566.  
   *arabicus*, 553, 557.  
   *boulengeri*, 548, 553,  
     554.  
   *calamita*, 547, 548, 549,  
     550, 551, 552, 553,  
     554, 555, 556, 557,  
     559, 565, 566.  
   *carens*, 547, 567.  
   *cinereus*, 560, 564, 569,  
     571.  
   *colchicus*, 569.  
   *commutatus*, 569.  
   *cruciatus*, 547.  
   *cursor*, 547.  
   *gargarizans*, 569.  
   *gariensis*, 564, 565,  
     566.  
   *griseus*, 569.  
   *guineensis*, 560, 563,  
     564.  
   *hemprichii*, 553.  
   *japonicus*, 569, 571.  
   *maculatus*, 560.  
   *mauritanicus*, 546, 557,  
     559, 560, 563, 564,  
     574.  
   *melanostictus*, 559.  
   *nubicus*, 560, 564.  
   *olivaceus*, 621.  
   *palmarum*, 569.  
   *pantherinus*, 557, 560,  
     563, 564, 566.  
   *raddei*, 547, 549, 551,  
     555, 556.  
   *regularis*, 547, 560,  
     563, 564, 567, 571,  
     574.  
   *roeselii*, 569.  
   *rubeta*, 569.  
   *schreberianus*, 553.  
   *spinosus*, 560, 563, 569.  
   *taitanus*, 547, 573.  
   *terrestris*, 569.  
   *terrestris fetidus*, 547.  
   *tuberosus*, 547, 564,  
     572, 573.  
   *variabilis*, 553.  
   *ventricosus*, 569.  
   *vertebralis*, 567.  
 Bufo  
   *viridis*, 546, 547, 548,  
     549, 551, 552, 553,  
     555, 556, 557, 558,  
     559, 564, 574.  
   *vulgaris*, 547, 561, 569,  
     571, 572.  
   *vulgaris japonicus*, 569,  
     571.  
 Buliminus  
   (*Chondrula*) *niso*, 124.  
   (—) *quadridens*, 123.  
   (—) *quadridens*, var.  
     *prolixa*, 123.  
 Bulimus  
   *cinereus*, 124.  
   *kirkii*, 217, 346.  
   *magilensis*, 217, 219.  
   *niloticus*, 345.  
   *obesus*, 217.  
   *ovoidea*, 217.  
   *punctatus*, 217.  
   (*Buliminus*) *ptychaxis*,  
     346, 352.  
   (*Pachnodus*) *dracken-*  
     *bergensis*, 615.  
   (*Stenogyra*) *linearis*,  
     616.  
   (—) *turriiformis*, 615.  
 Buteo  
   *vulgaris*, 308.  
 Cacatus  
   *cristata*, 309.  
   *galerita*, 309.  
   *leadbeateri*, 309.  
   *moluccensis*, 309.  
   *ophthalmica*, 67.  
 Cæcilianella  
   *aciola*, 135.  
   *eburnea*, 135.  
   *liesvillei*, 135.  
   *mauriana*, 135.  
   *merimeana*, 136.  
 Cairina  
   *moschata*, 511.  
 Calamoherpe  
   *syninx*, 574, 575.  
 Callerebia  
   *annada*, 147, 148.  
   *hybrida*, 147.  
   *nirmala*, 147, 148.  
   *scanda*, 148.  
 Callichrous  
   *bimaculatus*, 226.  
   *checkra*, 226.  
   *egertonii*, 225.  
   *pabda*, 225, 231.  
   *vittatus*, 225.  
 Calliste  
   *cyaneiventris*, 146.

- Calliste*  
*festiva*, 146.  
*melanota*, 146.  
*nigrirostris*, 146, 194.  
*thoracica*, 146.  
*tricolor*, 146.  
*Callithrix*  
*amicta*, 634, 636.  
*cuprea*, 394.  
*Callocephalon*  
*galeatum*, 309.  
*Caloramphus*  
*hayi*, 14.  
*Calorhinus*  
*ursinus*, 443.  
*Calornis*  
*pacificus*, 576.  
*Calotes*  
*versicolor*, 620.  
*Calyptomena*  
*viridis*, 381, 388.  
*Calyptrorhynchus*  
*funereus*, 77.  
*Camelus*  
*bactrianus*, 306.  
*dromedarius*, 306.  
*Campylorhynchus*  
*labradoricus*, 528.  
*Campylorhynchus*  
*balteatus*, 190.  
*fasciatus*, 190.  
*Cancerophagus*  
*gutturatus*, 491.  
*Canis*  
*alpinus*, 274, 275.  
*antarcticus*, 248, 250,  
253, 266, 267, 273,  
286.  
*anthus*, 248, 253; 255,  
266, 272, 276, 277,  
286.  
*argentatus*, 248, 249,  
261, 265, 288.  
*aureus*, 53, 248, 253,  
255, 256, 261, 266,  
276, 277, 286.  
*acarea*, 238, 240, 241,  
242, 243, 244, 245,  
246, 247, 248, 249,  
250, 251, 252, 253,  
255, 256, 261, 266,  
267, 268, 274, 288.  
*bengalensis*, 265, 266,  
272.  
*borbonidus*, 280.  
*brachyotus*, 71.  
*brasilensis*, 255, 264.  
*camana*, 248, 261, 264,  
265, 266.  
*cancerivorus*, 248, 253,  
254, 255, 259, 261,  
263, 266, 267, 268,  
270, 272, 280, 285,  
286, 287.  
*Canis*  
*chanco*, 278, 279.  
*cinereo-argentatus*, 248,  
250, 251, 253, 261,  
264, 265.  
*corsac*, 264, 265, 266.  
*dingo*, 248, 249.  
*domesticus*, 248, 253.  
*dukhumensis*, 274,  
275.  
*famelicus*, 248.  
*filholi*, 281.  
*fulvicaudus*, 266.  
*fulvipes*, 252, 254, 266,  
267, 270, 288.  
*fulvus*, 248, 265.  
*griseus*, 268.  
*hodophylax*, 274.  
*jubatus*, 248, 253, 262,  
266, 267.  
*lagopus*, 248, 265.  
*laniger*, 253, 278, 279.  
*lateralis*, 276, 277, 450.  
*latrans*, 248, 266, 267,  
272, 273, 286.  
*littoralis*, 248, 249, 250,  
251, 252, 253, 261,  
264, 265, 266, 288.  
*lupus*, 53, 248, 249,  
250, 253, 255, 260,  
261, 272, 274, 278,  
279, 286, 288, 304.  
*magellanicus*, 248, 249,  
266, 267, 268, 273.  
*megamastoides*, 280.  
*mesomelas*, 239, 264,  
276, 277, 286.  
*niloticus*, 248, 265.  
*nippon*, 274.  
*occidentalis*, 273.  
*pullipes*, 278, 279.  
*primævus*, 71, 248, 274,  
275, 276.  
*procyonoides*, 253, 259,  
262, 273.  
*rudis*, 266, 267.  
*rutilans*, 274.  
*simensis*, 248, 266, 276,  
277.  
*sumatrensis*, 248, 274,  
275.  
*velox*, 253, 261, 264,  
265, 266.  
*vetulus*, 261, 266, 267,  
282, 286.  
*virginianus*, 250, 265.  
*vulpes*, 53, 238, 241,  
242, 243, 244, 245,  
246, 247, 248, 261,  
265, 288.  
*Canis*  
*zerda*, 248, 250, 260,  
261, 262, 264, 265,  
272, 288.  
*Capra*  
*agrus*, 55.  
*jemlaica*, 186.  
*Capreolus*  
*caprae*, 55.  
*Carbo*  
*africanoides*, 491.  
*Cardinalis*  
*virginianus*, 313.  
*Cariacus*  
*rufinus*, 393.  
*(Coassus) nemorivagus*,  
400.  
*(—) rufinus*, 400.  
*Carollia*  
*brevicauda*, 395.  
*Carpophaga*  
*ænea*, 15.  
*oceanica*, 576.  
*Casarca*  
*leucoptera*, 512.  
*rutula*, 511.  
*tadornoides*, 512.  
*Castor*  
*fiber*, 60, 305.  
*Casuarium*  
*bennetti*, 27, 493.  
*galeatus*, 315.  
*Cataclysta*  
*elutalis*, 683.  
*fraterna*, 683.  
*nympha*, 683.  
*ornatalis*, 683.  
*secpunctalis*, 684.  
*tolumnalis*, 684.  
*Catamenia*  
*inornata*, 199.  
*Catephia*  
*dubia*, 678.  
*Cathartes*  
*atratus*, 308.  
*Catopsilia*  
*chryseis*, 669.  
*Cebus*  
*apella*, 643, 644.  
*capucinus*, 302, 634,  
642, 643, 644.  
*Celeus*  
*spectabilis*, 161.  
*timunculus*, 161.  
*torquatus*, 161.  
*Centropus*  
*rufipennis*, 469.  
*Cephalophus*  
*mergens*, 307.

- Ceratamma  
   *hobsoni*, 689.  
 Ceratophrys  
   *ornata*, 648.  
 Ceratorhinus  
   *sumatrensis*, 69.  
 Cercocebus  
   *collaris*, 301.  
   *fuliginosus*, 301.  
 Cercoleptes  
   *caudivolvulus*, 397, 400.  
 Cercopithecus  
   *griseoviridis*, 301.  
   *mona*, 301.  
   *pyrrhonotus*, 639.  
   *ruber*, 301.  
 Cereopsis  
   *nova-hollandiæ*, 317,  
     497, 535.  
 Cerotoma  
   *deyrollei*, 606.  
   *trifasciata*, 606, 609.  
 Certhiola  
   *magnirostris*, 193.  
 Certhiilauda  
   *semitorquata*, 491.  
 Cervulus  
   *muntjac*, 306.  
 Cervus  
   *aristotelis*, 307, 452.  
   *axis*, 307.  
   *canadensis*, 307.  
   *dama*, 54, 306.  
   *elaphus*, 54, 95, 98,  
     306, 420.  
   *equinus*, 452.  
   *lueldorfi*, 420, 451.  
   *porcinus*, 307.  
   *xanthopygus*, 420.  
 Ceryle  
   *cabanisi*, 210.  
 Chærocampa  
   *alecto*, 670.  
   *cretica*, 411, 415.  
   *oldenlandiæ*, 670.  
   *theylia*, 670.  
 Chætocercus  
   *bombus*, 206.  
 Chætura  
   *caudacuta*, 1.  
 Chalcophana  
   *buckleyi*, 593, 608.  
   *dimidiana*, 593,  
     608.  
   *effulgens*, 593, 608.  
   *ignicolis*, 593, 608.  
 Chalcoplaxis  
   *rufiventris*, 591, 608.  
 Chamæleo  
   *pumilus*, 188.  
   *vulgaris*, 188.  
 Chamæpelias  
   *passerina*, 314.  
   *talpacoti*, 314.  
 Chamæza  
   *nobilis*, 155.  
 Charadrius  
   *fulvus*, 576.  
   *minutus*, 38.  
   *pusillus*, 38.  
 Charaxes  
   *affinis*, 148.  
   *baya*, 148.  
   *watti*, 148, 152.  
 Chasmina  
   *glabra*, 675.  
 Chaulelasmus  
   *conesi*, 520.  
   *streperus*, 519, 534.  
 Chela  
   *bacaila*, 225, 230.  
 Chelys  
   *fimbriata*, 648.  
   *matamata*, 648.  
 Chen  
   *albatus*, 501.  
   *cærulescens*, 501.  
 Chenalopex  
   *egyptiaca*, 317, 498,  
     534.  
   *jubata*, 499.  
 Chilo  
   *chrysographella*, 690.  
 Chiroderma  
   *salvini*, 465.  
 Chlamydochorus  
   *truncatus*, 8, 11.  
 Chloëphaga  
   *canagica*, 501.  
   *magellanica*, 502.  
   *poliocephala*, 503.  
   *rubidiceps*, 503.  
 Chloronerypes  
   *callonotus*, 209.  
   *fumigatus*, 209.  
 Chlorophonia  
   *viridis*, 145, 146.  
 Chlorospingus  
   *berlepschi*, 195.  
   *castaneicollis*, 195, 196.  
   *superciliaris*, 195.  
 Cholepus  
   *didactylus*, 402.  
   *hoffmanni*, 402.  
 Cholopus  
   *didactylus*, 305.  
 Chondrostoma  
   *aculeatum*, 227.  
   *wattana*, 226.  
 Chrysomitris  
   *capitalis*, 199.  
   *columbiana*, 199.  
 Chrysophanus  
   *kasyapa*, 149.  
   *phleas*, 408.  
   *stygius*, 408, 415.  
   *timeus*, 408.  
 Chrysophlegma  
   *mystacalis*, 16.  
 Chrysoptilus  
   *abingoni*, 491.  
   *atricollis*, 209.  
   *bennettii*, 491.  
 Chrysothrix  
   *entomophaga*, 395.  
   *lunulata*, 395.  
   *nigritata*, 395.  
   *sciurea*, 303, 395.  
 Chrysotis  
   *bodini*, 23.  
   *cælogena*, 68.  
   *dufresniana*, 68.  
   *erythrura*, 23.  
   *leucocephala*, 311.  
   *vittata*, 311.  
 Chthonais  
   *apicalis*, 608, 609.  
 Ciconia  
   *alba*, 316.  
   *nigra*, 316.  
 Cidarig  
   *variegata*, 37.  
 Cinnyris  
   *mariquensis*, 491.  
   *talatata*, 491.  
 Cirrhina  
   *latia*, 225, 226, 229,  
     230, 231.  
   *mirigala*, 230.  
   *reba*, 230.  
 Cirochroista  
   *ætherialis*, 690.  
   *brizalis*, 690.  
 Cissopis  
   *leveriana*, 146.  
 Cisticola  
   *hypoxantha*, 624.  
   *ruficeps*, 66.  
 Clanculus  
   *bicarinatus*, 419, 420.  
 Clangula  
   *albicollis*, 527.  
   *glaucon*, 527, 534.  
   *islandica*, 527.  
 Clathurella  
   *bicolor*, 416.  
   *crassina*, 416, 420.  
   *rufonotata*, 415.  
 Clausilia  
   *bizarellina*, 101.  
   *pauvucciana*, 132, 142.  
   *punctata*, 101.  
   *solida*, 100, 101, 131.

- Clausilia  
   *virata*, 101.  
   (Delima) *punctata*,  
     131.  
   (—) *virata*, 131.  
   (Iphigenia), sp., 132.  
   (—) *bizarellina*,  
     132.  
   (Papillifera) *solida*,  
     131.  
 Caeligena  
   *warszewiczi*, 204.  
 Caelogenys  
   *paca*, 401.  
 Caelomera  
   *buckleyi*, 606, 609.  
   *cayennensis*, 607, 609.  
   *ruficollis*, 607, 609.  
   *violaceipennis*, 607.  
 Colaptes  
   *rupicola*, 209.  
   *stolzmanni*, 209.  
 Colaspis  
   *buckleyi*, 591, 608,  
     609.  
   *chlorites*, 592, 608.  
   *cruentata*, 181.  
   *foveicollis*, 592, 608,  
     609.  
   *fulvilabris*, 592, 608.  
   *lefevrei*, 591.  
   *nigripennis*, 592, 608,  
     609.  
 Colaspoides  
   *bicolor*, 594.  
   *cupreipennis*, 594,  
     608.  
   *elongatus*, 595, 608.  
 Colias  
   *edusa*, 409.  
   *erate*, 409.  
   *erate*, var. *pallida*,  
     409.  
   *helichtha*, 408.  
   *hyale*, 410.  
   *hyale*, var. *sareptensis*,  
     409.  
   *pallida*, 409.  
   *sareptensis*, 409.  
 Coliphimus  
   *concolor*, 491.  
 Collocalia  
   sp., 67.  
   *esculenta*, 67.  
   *francica*, 14, 67.  
   *fuctipha*, 67.  
   *linchi*, 67.  
   *vanicorensis*, 575.  
 Collonia  
   *roseopunctata*, 417,  
     420.  
 Colluricincla  
   *rugensis*, 575.  
 Colobus  
   *angolensis*, 68.  
   *palliatu*s, 68.  
 Columba  
   *leucocephala*, 314.  
 Columbula  
   *cruziana*, 213.  
 Conchylodes  
   *æriferalis*, 684.  
 Conirostrum  
   *sitticolor*, 193.  
 Conoclypeus  
   *anachoreta*, 46.  
   *leskii*, 45, 47, 49.  
   *sigsbei*, 46, 47.  
 Conothraupis  
   *speculigera*, 198.  
 Contopus  
   *punensis*, 203.  
 Conurus  
   *carolinensis*, 310.  
   *holochlorus*, 310.  
   *luteus*, 310.  
   *nitratus*, 211.  
 Conus  
   *albospira*, 480, 485.  
   *consanguineus*, 478,  
     479, 485.  
   *fulvocinctus*, 479.  
   *neptunoides*, 479, 485.  
   *neptunus*, 479.  
   *taylorianus*, 480, 485.  
   *straturatus*, 480.  
 Coracias  
   *abyssinicus*, 31, 32,  
     33.  
   *caudatus*, 31, 32, 33.  
   *garrula*, 467, 468, 472,  
     474.  
   *indica*, 468.  
   *spatulatus*, 31, 32, 33,  
     623.  
 Corbicula  
   *africana*, 618.  
   *oliphantensis*, 618, 619.  
 Corinea  
   *emissella*, 690.  
   *impariguttata*, 690.  
   *niviguttella*, 690.  
 Corvus  
   *corax*, 312.  
   *orru*, 65.  
 Corydon  
   *sumatranus*, 381, 382.  
 Corythaix  
   *buffoni*, 313.  
   *persa*, 313.  
 Cosmonetta  
   *histrionica*, 527.  
 Cosmophila  
   *indica*, 677.  
 Cotinga  
   *porphyrolema*, 155.  
 Coturnix  
   *communis*, 315.  
   *textilis*, 487.  
 Cona  
   *gigas*, 469, 470.  
   *olivaceiceps*, 469.  
 Crambomorpha  
   *entella*, 671.  
 Crambus  
   *sabulinus*, 689.  
 Craspedacusta  
   *soverbii*, 454.  
 Crateropus  
   *jardinii*, 490.  
 Crax  
   *globicera*, 315.  
 Cricetus  
   *accedula*, 60, 61.  
   *frumentarius*, 60.  
   *nigricans*, 60.  
   *pæus*, 61.  
 Crimissa  
   *cruralis*, 600, 609.  
 Criniger  
   *gutturalis*, 14.  
 Crithagra  
   *brasiliensis*, 311.  
   *selbyii*, 491.  
 Crocidura  
   *leucodon*, 51.  
 Crocodilus  
   *palustris*, 186.  
 Crossocheilus  
   *rostratus*, 226.  
 Crotophaga  
   *sulcirostris*, 210.  
 Cryptolechia  
   *atropicta*, 85.  
   *contrariella*, 85.  
 Cryptopterus  
   *latovittatus*, 225.  
 Cuculus  
   *canorus*, 469, 470.  
 Cyanocitta  
   *cristata*, 312.  
 Cyanocorax  
   *cyanopogon*, 312.  
 Cyclophorus  
   *maglensis*, 218, 219.  
 Cyclorhis  
   *contrerasi*, 192.  
 Cyclostoma  
   *elegans*, 99, 100, 140,  
     141, 142.  
   *kraussianum*, 617.  
   *lutetianum*, 99, 140,  
     141, 142.



*Cyclostoma*  
*physetum*, 99, 101, 140,  
 141, 142.  
*subelegans*, 142.  
*sulcatum*, 140, 141.  
*zanguebaricum*, 218.  
*Cyclothurus*  
*didactylus*, 408.  
*Cyclotus*  
*alabastris*, 619.  
*Cynalicus*  
*melanogaster*, 71.  
*Cynogale*  
*venatica*, 70.  
*Cygnus*  
*americanus*, 506.  
*atratus*, 317, 507, 535.  
*bewicki*, 507.  
*buccinator*, 506.  
*coscoroba*, 507.  
*davidi*, 507.  
*ferus*, 506.  
*immutabilis*, 506.  
*minor*, 507.  
*musicus*, 506, 534.  
*nigricollis*, 508.  
*olor*, 317, 505, 506,  
 534.  
*Cymbirhynchus*  
*macrorhynchus*, 381,  
 382, 384.  
*Cymoriza*  
*minima*, 684.  
*Cyncephalus*  
*anubis*, 302.  
*babouin*, 302.  
*hamadryas*, 302.  
*leucophaeus*, 302.  
*sphinx*, 302.  
*Cynodictis*  
*azaræ*, 281.  
*boriei*, 281, 282.  
*cayluzi*, 281.  
*crassidens*, 281.  
*greyi*, 281, 282.  
*intermedius*, 281.  
*leptorhynchus*, 281,  
 282.  
*vetulus*, 281.  
*Cynopithecus*  
*niger*, 302.  
*Cypræa*  
*decipiens*, 482, 485.  
*theristes*, 482, 483.  
*Cyprinus*  
*gohama*, 226.  
*sada*, 226.  
*Cypselus*  
*sulfurcatus*, 14.  
*Cyrtophora*  
*opuntia*, 321.

*Dacelo*  
*gigantea*, 313.  
*Dafila*  
*acuta*, 318, 515, 534.  
*bahamensis*, 318, 516.  
*erythrorhyncha*, 515,  
 534.  
*spinicauda*, 515.  
*Damalis*  
*egens*, 672.  
*Danaïis*  
*chrysippus*, 405.  
*formosa*, 183, 185.  
*leonora*, 183.  
*limniace*, 183, 666,  
 669.  
*petiverana*, 183.  
*plexippus*, 405.  
*Danio*  
*devario*, 230.  
*Daphnella*  
*fragilis*, 416.  
*Daption*  
*capensis*, 164.  
*Dasyprocta*  
*aguti*, 305.  
*Dasypus*  
*giganteus*, 402.  
*gigas*, 402.  
*maximus*, 402.  
*Daudebardia*  
*isseliana*, 94, 102, 148.  
*nubigena*, 102.  
*rufa*, 102.  
*Deilemera*  
*evergista*, 673.  
*maculata*, 673.  
*mutabilis*, 673.  
*Deilephila*  
*cretica*, 411.  
*dahlia*, 412.  
*hippophaes*, 412.  
*lathyrus*, 412.  
*robertsi*, 412, 415.  
*tithymali*, 412.  
*Deiopeia*  
*pulchella*, 414, 671.  
*Delias*  
*luzoniensis*, 668, 669.  
*Dendrochelidon*  
*mystacea*, 65.  
*Dendrocitta*  
*sinensis*, 312.  
*vagabunda*, 312.  
*Dendrocycna*  
*arborea*, 609.  
*arcuata*, 510, 534.  
*autumnalis*, 509.  
*discolor*, 509.  
*eytoni*, 510, 535.  
*fulva*, 508, 509, 510.

*Dendrocycna*  
*guttulata*, 509, 534.  
*major*, 510, 534.  
*vagans*, 510, 534,  
 535.  
*viduata*, 509, 534.  
*Dendrocycna*  
*arborea*, 509.  
*arcuata*, 15, 510.  
*autumnalis*, 509.  
*discolor*, 509.  
*fulva*, 509.  
*guttulata*, 509.  
*major*, 510.  
*vagans*, 510.  
*viduata*, 509.  
*Desmogramma*  
*marginella*, 600, 609.  
*Desmophyllum*  
*cailleti*, 42.  
*crista-galli*, 42.  
*lamprotichum*, 41, 42.  
*Deudorix*  
*selva*, 149.  
*Diabrotica*  
*angulicollis*, 604.  
*atriventris*, 606, 609.  
*basalis*, 605, 609.  
*dimidiata*, 602, 609.  
*discoidalis*, 603, 609.  
*divisa*, 605.  
*eximia*, 604.  
*flavonotata*, 604, 609.  
*generosa*, 605.  
*nigroplagiata*, 604,  
 609.  
*puncticollis*, 603, 609.  
*quadrinaculata*, 605,  
 609.  
*regalis*, 604.  
*translucida*, 603, 609.  
*variolora*, 603, 609.  
*verrucosa*, 603, 609.  
*Diadema*  
*kezia*, 667.  
*Diasemia*  
*geometralis*, 683.  
*Dicrurus*  
*dimacensis*, 15.  
*sumatranus*, 15.  
*Dicte*  
*coruscifasciella*, 78  
 79.  
*Didelphys*  
*cinerea*, 403.  
*derbiana*, 403.  
*murina*, 403.  
*ornata*, 403.  
*penicillatus*, 459.  
*Diglossa*  
*albilateralis*, 193.

- Diglossa*  
*aterrima*, 193.  
*personata*, 193.  
*Diomedea*  
*chlororhynchos*, 165.  
*exulans*, 165.  
*fuliginosa*, 165.  
*Diphlogena*  
*aurora*, 204.  
*warszewiczii*, 204.  
*Diplopterus*  
*nævius*, 210.  
*Dircema*  
*rufipennis*, 607, 609.  
*Discognathus*  
*lamta*, 226.  
*Diucopis*  
*speculigera*, 198.  
*Docimastes*  
*ensiferrus*, 204.  
*Doleschallia*  
*comriei*, 613.  
*dascon*, 612, 613, 614.  
*daseylus*, 612, 614.  
*Donacicola*  
*spectabilis*, 66.  
*Doryphora*  
*albovirens*, 597, 609.  
*alumna*, 597.  
*ambigua*, 597, 609.  
*batesi*, 596, 608.  
*buckleyi*, 597, 608.  
*celsa*, 596.  
*chapuisi*, 597, 609.  
*conneza*, 599, 609.  
*degaudei*, 597, 609.  
*12-guttata*, 598.  
*fabricii*, 597, 609.  
*festiva*, 597, 609.  
*flavomarginata*, 599.  
*flexuosa*, 597, 609.  
*fulgora*, 596, 608.  
*fulvicornis*, 597, 609.  
*funebria*, 597, 609.  
*hebe*, 597, 609.  
*javei*, 597, 609.  
*marginicollis*, 598, 609.  
*nympha*, 597, 609.  
*pluviata*, 597, 609.  
*princeps*, 596, 608.  
*pulchella*, 597.  
*punctatissima*, 596, 608.  
*rubropunctata*, 596, 608.  
*salvini*, 598.  
*selecta*, 599, 609.  
*serguttata*, 598, 609.  
*thomsoni*, 597, 609.  
*trifasciata*, 599.  
*vespertina*, 597, 609.  
*Dothitha*  
*thermusalis*, 682.  
*Dromæus*  
*novæ-hollandiæ*, 315.  
*Drymoochila*  
*incana*, 626.  
*Dryotriorchis*  
*spectabilis*, 621.  
*Dysithamnus*  
*plumbeus*, 158, 159.  
*subplumbeus*, 158.  
*Dysporus*  
*sula*, 577.  
*Earias*  
*insulana*, 674.  
*Echinolampas*  
*depressa*, 46, 47, 357, 358.  
*hellei*, 358.  
*orientalis*, 357.  
*oviformis*, 46, 47, 357, 358.  
*Echinus*  
*carinatus*, 34.  
*ovatus*, 34.  
*unicolor*, 34.  
*ventricosus*, 222.  
*Eelectus*  
*polychlorus*, 65, 66.  
*Ectopistes*  
*migratorius*, 314.  
*Elainea*  
*leucospodia*, 203.  
*obscura*, 203.  
*Elaphodus*  
*nichianus*, 538.  
*Elephas*  
*africanus*, 306.  
*indicus*, 306.  
*Elymnias*  
*nigrescens*, 667.  
*Elytrosphæra*  
*flammigera*, 600, 609.  
*Emballanura*  
*semicaudata*, 11.  
*Emberiza*  
*impetuaria*, 491.  
*tahapisi*, 491.  
*Eminia*  
*lepida*, 625.  
*Ennea*  
*anodon*, 347.  
*crassilabris*, 616, 619.  
*infans*, 616, 619.  
*lata*, 347, 352.  
*natalensis*, 619.  
*papillifera*, 347.  
*ujjienensis*, 347, 352.  
*Epeira*  
*cognata*, 320.  
*Epinephele*  
*davendra*, 405.  
*kispulla*, 406.  
*interposita*, 405, 415.  
*pallascens*, 406.  
*roxane*, 405.  
*Epidon*  
*australis*, 237.  
*chathamensis*, 236.  
*desmarestii*, 237.  
*novæ-zealandiæ*, 236.  
*Equus*  
*asinus*, 2.  
*burchelli*, 306.  
*caballus nanus*, 306.  
*Ercheia*  
*charon*, 678.  
*cyllaria*, 678.  
*fusifera*, 678.  
*Erebria*  
*kalinda*, 147.  
*Ergolis*  
*ariadne*, 667, 670.  
*Erinaceus*  
*europæus*, 51.  
*Eriodes*  
*frontatus*, 302.  
*Erismatura*  
*australis*, 530, 535.  
*dominica*, 530.  
*ferruginea*, 530.  
*leucocephala*, 530.  
*mooca*, 530, 534.  
*rubida*, 530.  
*Erynnis*  
*marrubii*, 411.  
*Erythropygia*  
*paena*, 491.  
*pectoralis*, 491.  
*Erythrura*  
*prasina*, 15.  
*trichroa*, 576.  
*Esox*  
*lucius*, 448.  
*Estrelida*  
*lipiniana*, 491.  
*squamifrons*, 491.  
*Euchloë*  
*daphalis*, 151.  
*simplonia*, 152.  
*venosa*, 151, 152.  
*Euchromia*  
*fraterna*, 370.  
*orientalis*, 670.  
*polymena*, 670.  
*Eudocimus*  
*ruber*, 316.  
*Eudyothis*  
*indica*, 685.  
*Eumelea*  
*aureliata*, 687.

- Eumenis*  
*thelephassa*, 405.  
*Eumeta*  
*pryeri*, 674.  
*Eumolpus*  
*prasinus*, 594, 608.  
*surinamensis*, 594,  
 608.  
*Euphonia*  
*chlorotica*, 146, 194,  
 312.  
*nigricollis*, 194.  
*pectoralis*, 146.  
*rufiventris*, 146.  
*serrirostris*, 194.  
*trinitatis*, 146.  
*violacea*, 144, 145,  
 146.  
*Eupithecia*  
*sp. inc.*, 688.  
*implicata*, 688.  
*tristrigosa*, 688.  
*Euplœa*  
*testifica*, 666, 669.  
*swinhoei*, 666.  
*Euplectes*  
*afar*, 313.  
*nigriiventris*, 476.  
*taka*, 491.  
*Euplocamus*  
*vieilloti*, 15.  
*Eupodotis*  
*australis*, 478.  
*denhami*, 477.  
*edwardsi*, 486.  
*Eurocephalus*  
*anguttimens*, 491.  
*Eurylæmus*  
*javanicus*, 14, 381.  
*ochromelas*, 381, 382,  
 383, 388.  
*Euryope*  
*batesi*, 169.  
*minuta*, 169.  
*nigripes*, 169.  
*sanguinea*, 169.  
*Eurystomus*  
*gularis*, 468.  
*Euscarthmus*  
*fulviceps*, 202.  
*Eusmerinthus*  
*kindermanni*, 413, 415.  
*Exanthemops*  
*rossii*, 501.  
*Falco*  
*feldeggii*, 449.  
*semitorquata*, 490.  
*severus*, 65.  
*Felis*  
*caracal*, 52.  
*Felis*  
*catus*, 52.  
*chaus*, 52.  
*jubata*, 52.  
*leo*, 303.  
*lynx*, 52.  
*macroura*, 396.  
*pardalis*, 396.  
*pardina*, 52.  
*pardus*, 51, 303, 358.  
*rufa*, 380.  
*tigrina*, 396.  
*tigris*, 303.  
*tulliana*, 51.  
*uncia*, 51.  
*Ferussacia*  
*abnormis*, 134, 135,  
 142, 665.  
*ambly*, 133, 134.  
*barclayi*, 664.  
*cylichna*, 665.  
*folliculus*, 134.  
*forbesii*, 134.  
*gronoviana*, 133, 134,  
 135, 142, 662, 664,  
 666.  
*hohenwarti*, 665.  
*leacockiana*, 665.  
*mitriformis*, 664.  
*monodonta*, 665.  
*procchia*, 134.  
*procerula*, 664.  
*pupaformis*, 665.  
*subambly*, 133.  
*tornatellina*, 665.  
*triticea*, 664.  
*vescoi*, 134.  
*Florisuga*  
*mellivora*, 204.  
*Fordonia*  
*unicolor*, 618.  
*Foudia*  
*erythrops*, 312.  
*Fregata*  
*aquila*, 163.  
*Fregetta*  
*melanogastra*, 164.  
*Fringilla*  
*nitens*, 476.  
*Fuligula*  
*affinis*, 525.  
*americana*, 526.  
*australis*, 526, 535.  
*capensis*, 526, 534.  
*collaris*, 525.  
*cristata*, 318, 524,  
 534.  
*ferina*, 318, 525,  
 534.  
*marila*, 525, 534.  
*mariloides*, 525.  
*Fuligula*  
*nationi*, 526.  
*novæ-zealandiæ*, 527,  
 535.  
*nyroca*, 526, 534.  
*ryfina*, 524, 533,  
 534.  
*valisneria*, 526.  
*Fumarius*  
*fasciatus*, 190.  
*Gadirtha*  
*impingens*, 678.  
*Galago*  
*moholi*, 490.  
*Galictis*  
*barbara*, 396.  
*Gallinago*  
*andina*, 213.  
*Gallus*  
*sonnerati*, 315.  
*Ganoris*  
*mannii*, 411.  
*Garrulus*  
*glandarius*, 312.  
*Gazella*  
*dama*, 307.  
*dorcas*, 55, 307.  
*subgutturosa*, 55.  
*Gecinus*  
*viridis*, 210.  
*Genetta*  
*vulgaris*, 53, 304.  
*Geobiastes*  
*squamigera*, 470.  
*Geopelia*  
*striata*, 314.  
*Geositta*  
*tenuirostris*, 200.  
*Geothlypis*  
*aquinoctialis*, 191.  
*poliocephala*, 191.  
*Geotrygon*  
*frenata*, 213.  
*Gerbillus*  
*brantsii*, 490.  
*erythrurus*, 60, 64.  
*pæba*, 490.  
*Geronticus*  
*calvus*, 356.  
*comatus*, 356.  
*Girasia*  
*burtii*, 294.  
*brunnea*, 294, 299.  
*crocea*, 294.  
*extranea*, 291.  
*gigas*, 293, 295,  
 297.  
*hookeri*, 291, 292, 294,  
 297, 299.  
*magnifica*, 294, 298.

## Girasia

- nagaensis*, 294.  
*peguensis*, 294.  
*problematica*, 292.  
*radha*, 294.  
*rutellum*, 291.  
*shillongensis*, 293, 294,  
 298, 299.

## Glyphodes

- bivitalis*, 684.  
*itisalis*, 684, 685.  
*lacteata*, 685.  
*malayana*, 684.  
*zelimalis*, 685.

## Glyphostoma

- paucimaculata*, 416,  
 420.

## Godara

- comalis*, 686.

## Gonorrhynchus

- brevis*, 226.  
*funbriatus*, 226.  
*macrostomus*, 226.

## Grallaria

- albiloris*, 201.  
*dignissima*, 160.  
*ruficapilla*, 161, 201.  
*squanicera*, 161.

## Grammodes

- ammonia*, 679.  
*mygdon*, 679.

## Graphiurus

- capensis*, 40.

## Grus

- americana*, 315.  
*antigone*, 315.  
*regulorum*, 93.

## Gubernatrix

- cristatella*, 313.

## Gygis

- alba*, 577.  
*candida*, 162,  
 163.

## Gymnorhina

- leuconota*, 312.

## Gyps

- fulvus*, 308.

## Hæmatopus

- ostralegus*, 316.

## Halcyon

- sancta*, 65.

## Halia

- priamus*, 665.

## Haliaetus

- leucocephalus*, 308.

## Halmaturus

- bennetti*, 305.

## Hapale

- jacchus*, 303.  
*pygmaea*, 305.

## Haplocheilus

- panchar*, 230.

## Harelda

- glacialis*, 527.

## Helianthea

- aurora*, 204.

## Helicarion

- auriforme*, 298.  
*bensoni*, 298.  
*birmanicum*, 298.  
*cassida*, 298.  
*christiana*, 298.  
*cuvieri*, 291.  
*edgarianum*, 298.  
*extraneum*, 298.  
*flemingianum*, 298.  
*gigas*, 294.  
*heteroconcha*, 298.  
*irradians*, 298.  
*layardi*, 298.  
*membranaceum*, 298.  
*monticola*, 298.  
*ovatum*, 298.  
*planospira*, 298.  
*praestans*, 298.  
*resplendens*, 294.  
*scutella*, 298.  
*tennentii*, 298.  
*theobaldi*, 291.  
*verrucosum*, 298.

## Heliochera

- rubrocristata*, 203.

## Heliothis

- arnigera*, 676.  
*succinea*, 676.

## Heliotrypha

- viola*, 205, 206.  
*micraster*, 205.

## Helix

- aedesima*, 110.  
*alticola*, 120.  
*ancona*, 101, 115, 117,  
 118.  
*arbutorum*, 290.  
*aspera*, 100, 101, 140,  
 290, 291.  
*benneti*, 110.  
*bensoni*, 292.  
*candidula*, 122, 123.  
*cantiana*, 117.  
*carthusiana*, 117.  
*cemeulea*, 101, 117,  
 118.  
*cespitem*, 100, 101, 120,  
 121, 140.  
*ciliata*, 118.  
*cingulata*, 115.  
*colorata*, 110, 116.  
*concreta*, 119.  
*crassilabris*, 119.  
*crassior*, 110.

## Helix

- crimoda*, 119.  
*delacourti*, 118.  
*diaga*, 101, 118,  
 119.  
*dismasthia*, 120.  
*ferneri*, 120.  
*galloprovincialis*, 117.  
*globosus*, 619.  
*grimaldiensis*, 113.  
*quevarriana*, 118.  
*hortensis*, 290.  
*illuviosa*, 123.  
*illuviosa*, 123.  
*kooringensis*, 419.  
*lactea*, 110.  
*lubrica*, 665.  
*lucasi*, 110.  
*lucida*, 106.  
*luteofasciata*, 123.  
*major*, 123.  
*maritima*, 122.  
*maureliana*, 114.  
*mentonica*, 110.  
*minor*, 123.  
*monacensis*, 103.  
*moutoni*, 118, 119.  
*mozambicensis*, 216.  
*memoralis*, 101, 110, 111,  
 112.  
*niciensis*, 97, 98,  
 101.  
*obvoluta*, 101.  
*aedesima*, 111.  
*olivoluta*, 101.  
*paretiana*, 99, 100,  
 105, 108, 110, 112,  
 113, 116, 120, 121,  
 133, 139, 140, 141,  
 142.  
*planospira*, 114.  
*pomatia*, 290.  
*primitiva*, 115, 116,  
 117.  
*pyramidata*, 123.  
*ramoriniana*, 98.  
*robusta*, 114.  
*rubella*, 117.  
*silveri*, 419.  
*spania*, 112.  
*speluncarum*, 116.  
*subarenarum*, 121.  
*subfossilis*, 118.  
*submemoralis*, 112.  
*symmetrica*, 614,  
 619.  
*telonensis*, 118, 119.  
*terveri*, 121.  
*tarrieula*, 139.  
*usanbarica*, 216,  
 219.

## Helix

- ventricosa*, 119.  
*ventrosus*, 119.  
*vermicularia*, 109.  
*vermiculata*, 100, 113,  
 140.  
*williamsiana*, 110.  
*zanguebarica*, 217,  
 219.  
*zonata*, 114.  
 (Ampelita) *percyana*,  
 485.  
 (Campylæa) *cingulata*,  
 101, 115.  
 (—) *maureliana*,  
 114.  
 (—) *ramoriniana*,  
 115.  
 (Cochlicella) *acuta*,  
 119.  
 (—) *barbara*, 119.  
 (Euparypha) *pisana*,  
 119.  
 (Fruticicola) *anconæ*,  
 117.  
 (—) *cemenelca*, 117.  
 (—) *ciliata*, 118.  
 (—) *cinctella*, 118.  
 (—) *diæga*, 119.  
 (—) *gelida*, 118.  
 (—) *moutoni*, 118.  
 (—) *telonensis*, 119.  
 (Gonostoma) *obvoluta*,  
 108.  
 (Macularia) *niciensis*,  
 115.  
 (—) *vermiculata*,  
 113.  
 (Patula) *abietina*, 108.  
 (—) *pygmaea*, 108.  
 (—) *rupestris*, 108.  
 (Pella) *planti*, 614.  
 (Pomatia) *aperta*, 113.  
 (—) *aspera*, 112.  
 (Rhagada) *bordaensis*,  
 419, 420.  
 (Tachea) *bennetiana*,  
 111.  
 (—) *mentonica*, 109.  
 (—) *nemoralis*, 112.  
 (—) *ædesina*, 110.  
 (—) *paretiana*, 108.  
 (—) *williamsiana*,  
 111.  
 (Xerophila) *cespitem*,  
 120.  
 (—) *conspurcata*,  
 123.  
 (—) *lineata*, 122.  
 (—) *neglecta*, 122.  
 (—) *paladilhi*, 122.

## Helix

- (Xerophila) *pseuden-*  
*halia*, 122.  
 (—) *pyramidata*,  
 123.  
 (—) *sclera*, 121.  
 (—) *subcespitem*,  
 120.  
 (—) *terrestris*, 122.  
 (—) *terveri*, 121.  
 (—) *unifasciata*, 123.  
 (—) *variabilis*, 122.  
 Helotarsus  
*cecaudatus*, 308.  
 Hemipus  
*intermedius*, 16.  
*picatus*, 16.  
 Heniconetta  
*stelleri*, 527.  
 Herpestes  
*ichneumon*, 53, 304.  
*widdringtoni*, 288.  
 Herpsilochmus  
*frater*, 159.  
 Hesperia  
*bada*, 669.  
*bevani*, 669.  
*democritus*, 667.  
*malvarum*, var. *mar-*  
*rubii*, 411.  
*matthias*, 669.  
*plinius*, 667.  
*strabo*, 667.  
 Hesperomys  
*angouya*, 696.  
*covesi*, 696.  
*panamensis*, 11.  
*sumichrasti*, 696.  
 Heterocercus  
*aurantiivertex*, 157.  
*flavivertex*, 157.  
 Heteronetta  
*melanocephala*, 520.  
 Heterophasia  
*simillima*, 16.  
 Hipparchia  
*diffusa*, 147.  
*parisatis*, 405.  
*semele*, 147.  
*thelephassa*, 405.  
 Hipponoë  
*sardica*, 35.  
 Hirundo  
*albiventris*, 193.  
*caudacuta*, 1.  
*ciris*, 1.  
*leucopygia*, 192.  
 Histrionicus  
*torquatus*, 527.  
 Holacanthus  
*tricolor*, 23, 356.

## Holochilus

- sp. inc., 401.  
 Holopneustes  
*porosissimus*, 439.  
*purpurascens*, 439.  
 Homodes  
*thermesioides*, 680.  
 Homophoeta  
*affinis*, 173.  
*albofasciata*, 174.  
*bitaniatus*, 173, 182.  
*militaris*, 172, 173.  
 Hoplites  
*auriformis*, 292.  
*heteroconcha*, 292.  
*magnificus*, 292.  
*peguensis*, 292.  
*resplendens*, 292.  
*solidus*, 292.  
 Hyæna  
*striata*, 53, 303.  
 Hyalina  
 sp. inc., 107.  
*blanneri*, 106, 107.  
*blondiana*, 105, 106.  
*cellaria*, 106.  
*eugyrus*, 101, 106.  
*fodereana*, 106,  
 107.  
*glabra*, 105.  
*herculeæ*, 100, 104.  
*leopoldiana*, 104.  
*lucida*, 106, 107.  
*maccana*, 101, 106,  
 107.  
*macrobiota*, 104.  
*mentonica*, 107,  
 142.  
*olivetorum*, 100.  
*paretiana*, 104.  
*planorboides*, 106.  
*subincerta*, 104.  
*villa*, 106.  
 (Retinella) *herculeæ*,  
 104.  
 (—) *likes*, 105.  
 (—) *olivetorum*, 104,  
 105.  
 (Vitrea) *tenebræria*,  
 107.  
 Hydrillodes  
*indistincta*, 681.  
 Hydrocampa  
*aquatilis*, 685.  
 Hydrocissa  
*convexa*, 14.  
 Hylophilus  
*fuscicapillus*, 155.  
*semibrunneus*, 155.  
 Hymenia  
*fascialis*, 683.

- Hymenolæmus  
*malacorhynchus*, 527,  
 535.  
 Hypena  
*subcyanca*, 681.  
*subviolacea*, 681.  
 Hyphantornis  
*personata*, 313.  
 Hypochera  
*nigerrima*, 476.  
*nitens*, 312, 475.  
 Hypochroma  
*ruginaria*, 686.  
 Hypochrysis  
*aurora*, 204.  
 Hypocnemis  
*lepidonota*, 160.  
*pæcilonota*, 160.  
*stellata*, 160.  
*theresa*, 160.  
 Hypolimnas  
*kezia*, 667.  
*misippus*, 667.  
 Hyponomeuta  
*assamensis*, 691.  
*circumdatellus*, 691.  
*lapidellus*, 86, 93.  
*multipunctella*, 84, 85.  
*ordinatellus*, 84.  
 Hypotenidia  
*striata*, 15.  
 Hypoxanthus  
*brevirostris*, 209.  
 Hypsa  
*egens*, 672.  
*zebrina*, 672.  
 Hypsiprymnus  
*murinus*, 305.  
 Hystrix  
*eristata*, 64, 305.  
 Ianthocincla  
*lugubris*, 15.  
 Ibis  
*æthiopica*, 316.  
 Ichneumon  
*cauvi*, 490.  
*ratlamuchi*, 490.  
 Icterus  
*mesomelas*, 200.  
 Icteyon  
*crassivultus*, 71.  
*major*, 70.  
*venaticus*, 70, 253, 268,  
 269, 288.  
 Ictonyx  
*zorilla*, 53.  
 Idmais  
*tripuncta*, 149.  
 Ilerda  
*androcles*, 149.  
 Ilerda  
*sena*, 149.  
*tamu*, 149.  
 Incurvaria  
*solenobiella*, 82, 92.  
 Irideria  
*exotica*, 350.  
*nilotica*, 350.  
 Ischiopachys  
*bicolor*, 591, 608.  
*fulgidipennis*, 591,  
 608.  
 Ixias  
*agniverna*, 150.  
*dharmala*, 150, 151,  
 152.  
*frequens*, 151, 152.  
*mariannæ*, 150.  
*watti*, 151, 152.  
 Ixidia  
*leucogrammica*, 15.  
*squamata*, 14.  
 Jartheza  
*chrysographella*, 690.  
*simplex*, 690.  
 Katha  
*immaculata*, 671.  
*intermixta*, 671.  
 Labeo  
*cæruleus*, 229, 230.  
*calbasu*, 230.  
*diplostomus*, 225, 229,  
 230, 231.  
*dyocheilus*, 229, 230,  
 231.  
*rohita*, 230.  
*sindensis*, 230.  
 Lactica  
*macula*, 172.  
 Læmanotus  
*longipes*, 188.  
 Lafresnaya  
*gayi*, 204.  
 Lagoptera  
*dotata*, 679.  
 Lagothrix  
*humboldti*, 634.  
*infumata*, 394.  
 Lama  
*peruana*, 306.  
 Lamellaria  
*ophione*, 416.  
 Lampides  
*bætica*, 406, 407.  
*cnejus*, 407.  
*contracta*, 406, 407,  
 415.  
*democritus*, 667, 669.  
 Lampides  
*dipora*, 149.  
*galba*, 407.  
*plinii*, 667.  
*strabo*, 667.  
*varunana*, 667.  
 Lamprocolius  
*chalybeus*, 311.  
 Lamprolenis  
*nitida*, 611, 614.  
 Lampronetta  
*fischeri*, 523.  
 Lamprotia  
*oregonella*, 91, 93.  
*rubella*, 92.  
*tripunctella*, 92, 93.  
 Lamprosoma  
*cyaneum*, 167.  
*guatemalensis*, 168.  
*ignicolle*, 167.  
*politum*, 168.  
*scintillans*, 168.  
*speciosum*, 168.  
*violaceum*, 167.  
 Lamprotornis  
*cæneus*, 311.  
 Lanarius  
*atrococcineus*, 623.  
*atrococcus*, 623.  
 Lanistes  
*farleri*, 219.  
 Laphygma  
*infecta*, 676.  
 Larus  
*argentatus*, 318.  
*canus*, 318.  
*eburneus*, 538.  
*marinus*, 318.  
*ridibundus*, 318.  
 Latirus  
*craticulatus*, 482.  
*nagasakiensis*, 482,  
 485.  
*varicosus*, 482.  
 Leadbeatera  
*warszewiczi*, 204.  
 Leda  
*patagonica*, 351.  
 Lema  
*bipartita*, 589.  
*cincta*, 588.  
*degaudei*, 589.  
*flavicornis*, 589, 608.  
*limbatipennis*, 588.  
*semicyanea*, 588, 608,  
 609.  
*viridana*, 588, 608.  
 Lemur  
*albifrons*, 303.  
*brunneus*, 303.  
*leucomystax*, 451.

- Lemur  
   *macaco*, 451.  
   *mongoz*, 303.  
   *nigerrimus*, 451.  
   *xanthomystax*, 303.  
   *varius*, 303.  
 Leptoptila  
   *rufavilla*, 212.  
 Leptoptilus  
   *crumeniferus*, 316.  
 Leptosoma  
   *anthracinum*, 672.  
   *arcuatum*, 673.  
   *assimile*, 672.  
   *clathratum*, 673.  
   *coleta*, 673.  
   *discolor*, 465.  
   *flavescens*, 673.  
   *herklotsii*, 672.  
   *inconstans*, 673.  
   *latistriga*, 673.  
   *leucostigma*, 673.  
   *luctuosum*, 673.  
   *ludekingii*, 673.  
   *macklotti*, 673.  
   *marginale*, 673.  
   *mülleri*, 673.  
   *noviespunctatum*, 673.  
   *nubecula*, 673.  
   *pallens*, 673.  
   *quadriguttatum*, 673.  
   *scalarium*, 673.  
 Leptotarsis  
   *eytoni*, 510.  
 Lepus  
   *caspicus*, 64.  
   *europæus*, 64.  
   *syriacus*, 64.  
 Lepyrodes  
   *geométralis*, 683.  
 Lesbia  
   *gouldi*, 206.  
   *gracilis*, 206.  
 Leucania  
   *extranea*, 675.  
   *inferens*, 674, 675.  
   *insularis*, 674.  
   *loreyi*, 674.  
   *percussa*, 674.  
 Leucochroa  
   *candidissima*, 100,  
     108.  
 Leucolia  
   *pelzelni*, 208.  
 Leucopternis  
   *plumbea*, 155.  
 Licmetis  
   *tenuirostris*, 76, 309.  
 Limax  
   *sp. inc.*, 102, 103.  
   *agrestis*, 102.  
 Limax  
   (Krynckillus) *menton-  
     nicus*, 103.  
   (—) *niciensis*, 103.  
 Limenitis  
   *trivena*, 148.  
 Limicolaria  
   *cailliaudi*, 346.  
   *nilotica*, 345.  
   *senmaariensis*, 346.  
 Limnæa  
   *natalensis*, 617, 619.  
 Limnocodium  
   *victoria*, 454.  
 Limonidromus  
   *indicus*, 15.  
 Limosa  
   *melanura*, 316.  
 Linaria  
   *atrogularis*, 491.  
   *gularis*, 491.  
 Liothrix  
   *luteus*, 311.  
 Liotia  
   *crassibasis*, 484, 485.  
 Lissotriton  
   *punctatus*, 544.  
 Lithoglyphus  
   *zonatus*, 344, 350.  
 Lonchoglossa  
   *wiedi*, 464.  
 Lovea  
   *tornatellina*, 132, 663.  
 Loxia  
   *lathamii*, 491.  
 Lupus  
   *pallipes*, 273.  
 Lutra  
   *vulgaris*, 54, 304.  
 Lycæna  
   *argus*, 407, 408.  
   *ariana*, 149.  
   *bracteata*, 407, 415.  
   *icarus*, 407.  
   *icarus*, var. *persica*,  
     407.  
   *indica*, 668, 669.  
   *persica*, 407.  
   *sangra*, 668.  
 Lyaon  
   *pictus*, 73, 248, 355.  
 Lymantria  
   *hascara*, 673.  
 Macacus  
   *cynomolgus*, 301.  
   *erythræus*, 302.  
   *inuus*, 302.  
   *leoninus*, 537.  
   *nemestrinus*, 302.  
   *radiatus*, 301.  
 Macacus  
   *rhesus*, 538.  
   *silenus*, 302.  
   *tcheliensis*, 537, 538.  
 Machetes  
   *pugnax*, 316.  
 Macrochlamys  
   *decussata*, 297.  
   *honesta*, 289.  
 Macroglossa  
   *nigrifasciata*, 670.  
   *stellatarum*, 403.  
 Macroscelides  
   *brachyrhynchus*, 490.  
   *intyxi*, 490.  
 Macularia  
   *vermiculata*, 100.  
 Majaqueus  
   *æquinoctialis*, 164.  
 Malaconotus  
   *australis*, 490.  
   *similis*, 490.  
 Malacorhynchus  
   *membranaceus*, 524,  
     535.  
 Malacosoma  
   *obsoletum*, 607, 609.  
   *olivaceum*, 607, 609.  
 Mamestra  
   *dolorosa*, 676.  
 Mareca  
   *albogularis*, 519.  
   *americana*, 514.  
   *castanea*, 518.  
   *chiloensis*, 514.  
   *penelope*, 518, 514, 534.  
   *sibilatrix*, 514.  
 Margaronia  
   *brizoalis*, 690.  
   *pomonalis*, 685.  
 Margarornis  
   *squamigera*, 201.  
 Marmaronetta  
   *angustirostris*, 520,  
     533, 534.  
 Martes  
   *foina*, 53.  
   *sylvatica*, 53.  
 Maruca  
   *aquatilis*, 685.  
 Mastacembelus  
   *armatus*, 225, 230, 231.  
 Mastotethus  
   *buckleyi*, 589, 608.  
   *chontalensis*, 166.  
   *modestus*, 589, 608,  
     609.  
   *rogersi*, 166.  
   *suavis*, 590, 608.  
   *thoracicus*, 589, 608.  
   *vicinus*, 166.

- Megaderma*  
*cor*, 462.  
*frons*, 461, 462.  
*gigas*, 420, 461, 465.  
*lyra*, 461.  
*spasma*, 461, 462.  
*Megalopterus*  
*australis*, 491.  
*Megalopus*  
*armatus*, 591, 608.  
*Megalotis*  
*australis*, 491.  
*verticalis*, 491.  
*Megalurus*  
*interscapularis*, 65.  
*Melania*  
*ferruginea*, 219.  
*nassa*, 344, 348.  
*zanguebarensis*, 219.  
*Melanitis*  
*amabilis*, 610.  
*leda*, 666.  
*Meleagris*  
*ocellata*, 537.  
*Meles*  
*taxus*, 53, 304.  
*Melitaea*  
*balbata*, 149.  
*didyma*, 406.  
*persca*, 406.  
*robertsi*, 406, 415.  
*Merganetta*  
*armata*, 530.  
*leucogenys*, 531.  
*turneri*, 531.  
*Merganser*  
*australis*, 531.  
*Mergus*  
*albellus*, 531.  
*australis*, 531, 535.  
*castor*, 531.  
*cucullatus*, 531.  
*merganser*, 531.  
*octosetaceus*, 532.  
*serrator*, 531, 534.  
*Morops*  
*philippinus*, 14.  
*Merula*  
*liboniana*, 490.  
*litsitsirupa*, 490.  
*obscura*, 490.  
*Mespilia*  
*globulus*, 434.  
*Messaras*  
*erymanthis*, 667.  
*Metabolus*  
*rugensis*, 574, 575.  
*Metallura*  
*smaragdiniensis*, 207.  
*Metaxyonychia*  
*lefevrei*, 591, 608.  
*rufofimbata*, 181.  
*Metopiana*  
*peposuca*, 524.  
*Metopoceros*  
*cornutus*, 648.  
*Micra*  
*derogata*, 677.  
*Microcyphus*  
*maculatus*, 426.  
*zigzag*, 426.  
*Microglossa*  
*aterrima*, 309.  
*Micronia*  
*aculeata*, 688.  
*gannata*, 688.  
*Micropteryx*  
*aurosparsella*, 83, 92.  
*calthella*, 84.  
*luteiceps*, 83.  
*pardella*, 83, 92.  
*promivorella*, 83.  
*uminaculella*, 84.  
*Midas*  
*illigeri*, 395.  
*nigrifrons*, 395.  
*Milax*  
*n. sp.*, 103.  
*sp. inc.*, 103.  
*carinata*, 103.  
*gagates*, 103.  
*Miltochrista*  
*sinica*, 671.  
*Milvus*  
*govinda*, 14.  
*Mimus*  
*longicaudatus*, 190.  
*Mirafra*  
*africana*, 491.  
*africanoides*, 491.  
*sabota*, 491.  
*Mitua*  
*salvini*, 155.  
*tuberosa*, 315.  
*Modiana*  
*scitovitallia*, 689.  
*Molossus*  
*abrasus*, 395.  
*Molothrus*  
*purpurascens*, 191, 197.  
200.  
*Monocesta*  
*dimidiata*, 607, 609.  
*splendida*, 608.  
*Monticola*  
*saxatilis*, 311.  
*Munia*  
*forbesi*, 66.  
*hemimelana*, 66.  
*malacca*, 312.  
*Munia*  
*melana*, 65, 66.  
*Murex*  
*(Pteronotus) bednalli*, 418, 419.  
*Mus*  
*abbotti*, 61.  
*bactrianus*, 61, 62.  
*concha*, 490.  
*decumanus*, 11, 61.  
*exulans*, 11, 13.  
*hugeli*, 12, 13.  
*lehocla*, 490.  
*major*, 62.  
*marikguensis*, 490.  
*minutus*, 62.  
*musculus*, 61.  
*mystacinus*, 62.  
*paohycercus*, 62.  
*rattus*, 61.  
*sylvaticus*, 62.  
*tomak*, 62.  
*vitiensis*, 13.  
*wagneri*, 62.  
*Muscardinus*  
*avellanarius*, 40.  
*Musciapa*  
*fuscula*, 626.  
*infulata*, 626.  
*Musoplaga*  
*violacea*, 313.  
*Mustela*  
*putorius*, 396.  
*sarmatica*, 53.  
*vulgaris*, 53.  
*Mutela*  
*exotica*, 345, 350.  
*Mycalesis*  
*drusia*, 667.  
*melanopsis*, 610, 614.  
*mineus*, 667, 669.  
*mucia*, 610.  
*oriseis*, 611.  
*Mycetes*  
*niger*, 393, 394.  
*palliatius*, 394.  
*seniculus*, 394, 631, 642.  
*stramineus*, 394.  
*Myiagra*  
*albiventris*, 576.  
*oceanica*, 574, 575.  
*pluto*, 576.  
*Myiarchus*  
*nigriceps*, 203.  
*semirufus*, 203.  
*Myiobius*  
*crypterythrurus*, 203.  
*rufescens*, 203.  
*Myiochanes*  
*cinereus*, 157.  
*nigrescens*, 157.



- Myiodynastes  
   *atrifrons*, 203.  
 Myiophoneus  
   *castaneus*, 16.  
   *dicrorhynchus*, 16.  
 Myiozetetes  
   *sulphureus*, 28.  
 Myodora  
   *albida*, 583.  
   *antipodum*, 585, 587.  
   *boltonii*, 585, 587.  
   *brevis*, 580, 581.  
   *compressa*, 587.  
   *convexa*, 583, 586.  
   *crassa*, 581.  
   *curvata*, 582.  
   *fluctuosa*, 583.  
   *novæ-zealandiæ*, 584,  
     587.  
   *oblonga*, 582, 587.  
   *ovalis*, 581.  
   *ovata*, 582, 583, 584,  
     587.  
   *pandoriformis*, 581, 583,  
     585, 586.  
   *plana*, 582, 587.  
   *proxima*, 586, 587.  
   *reeveana*, 586, 587.  
   *rotunda*, 580.  
   *rotundata*, 580.  
   *striata*, 579, 580,  
     585.  
   *subrostrata*, 584, 587.  
   *tasmanica*, 583.  
   *tenuisculpta*, 587.  
   *tincta*, 582.  
   *triangularis*, 586.  
   *trigona*, 582, 583, 586,  
     587.  
 Myoxus  
   *dryas*, 41, 60.  
   *elegans*, 40.  
   *javanicus*, 41.  
   *lasiotis*, 40, 41.  
 Myrmecophaga  
   *jubata*, 403.  
 Myrmoherula  
   *fulviventris*, 159.  
   *gularis*, 159.  
   *spodionota*, 159.  
 Myrtis  
   *fanny*, 206.  
 Myurella  
   *belcheri*, 481.  
   *guayaquilensis*, 481.  
 Myzomela  
   *cineracea*, 65.  
   *rubrata*, 575.  
 Naja  
   *tripudians*, 621.  
 Nanina  
   *monticola*, 114.  
 Nasiterna  
   *pugio*, 76.  
   *pugnæa*, 76.  
 Nassa  
   *labecula*, 415.  
   *lirella*, 415.  
 Nasua  
   *narica*, 304.  
   *nasica*, 397.  
   *rufa*, 397.  
 Natalus  
   *lepidus*, 444.  
   *micropus*, 443, 444.  
   *stramineus*, 443, 444.  
 Nemacheilus  
   *botia*, 230.  
 Nemosia  
   *chrysopsis*, 155.  
   *inornata*, 195.  
   *ornata*, 195.  
   *sordida*, 156.  
 Neomys  
   *panamensis*, 11.  
 Neopus  
   *malayensis*, 14.  
 Neothauma  
   *tanganyicense*, 344, 349,  
     352.  
 Neotragus  
   *damarensis*, 20, 21, 22.  
   *kirki*, 17, 19, 20, 21,  
     22.  
   *saltianus*, 17, 18, 19,  
     20, 21, 22.  
 Nephopteryx  
   *hyemalis*, 689.  
   *seminivella*, 689.  
 Neptis  
   *mahendra*, 148.  
 Nesonetta  
   *aucklandica*, 530, 535.  
 Nettapus  
   *auritus*, 505.  
   *coromandelianus*, 505.  
   *pulchellus*, 505.  
   *albipennis*, 505, 535.  
   *auritus*, 505, 534.  
 Nettopus  
   *coromandelianus*, 505,  
     534.  
   *pulchellus*, 505, 535.  
 Neuria  
   *retina*, 676.  
 Neürotichus  
   *gibbsii*, 443.  
 Niltava  
   *grandis*, 14.  
 Noctua  
   *armigera*, 676.  
 Noctua  
   *dotata*, 679.  
   *frugalis*, 680.  
 Nola  
   *candida*, 671.  
   *innocua*, 671.  
   *spretta*, 671.  
   *strigulalis*, 672.  
 Nonagria  
   *gracilis*, 675.  
 Nothoprocta  
   *curvirostris*, 213.  
 Notopteris  
   *macdonaldi*, 11.  
 Numenius  
   *phaeopus*, 576.  
   *uropygialis*, 576.  
 Numida  
   *elliotti*, 539.  
   *pucherani*, 539.  
 Nychitona  
   *niobe*, 668.  
 Nyctemera  
   *bavulus*, 672.  
 Nyctereutes  
   *procyonides*, 73.  
 Nycticorax  
   *caledonicus*, 65.  
   *manillensis*, 577.  
 Nyctipithecus  
   *rufipes*, 634.  
   *trivirgatus*, 303, 394.  
   *vociferans*, 634.  
 Nyroca  
   *australis*, 526.  
   *brunnea*, 526.  
   *ferina*, 525.  
   *leucophthalmos*, 526.  
 Oceanites  
   *oceanicus*, 164.  
 Ochthodireta  
   *fumigatus*, 202.  
 Ochthoeca  
   *fumicolor*, 202.  
   *lessoni*, 202.  
   *leucometopa*, 202.  
   *leucophrys*, 202.  
   *rufimarginata*, 202.  
   *stictoptera*, 202.  
 Oedemia  
   *americana*, 529.  
   *fusca*, 529, 534.  
   *nigra*, 528.  
   *perspicillata*, 529.  
   *velvetina*, 529.  
 Oedionychis  
   *abbreviata*, 180.  
   *bifasciata*, 179, 180,  
     600, 609.  
   *binotata*, 177, 182.

- Edionychis**  
*clavicornis*, 175.  
*cosinogrammica*, 180.  
*crucigera*, 175, 182.  
*duodecimmaculata*, 176.  
*godmani*, 178.  
*laticollis*, 181.  
*marginicollis*, 180, 182.  
*nigricollis*, 178, 182.  
*obscuripennis*, 176, 182.  
*ornata*, 174.  
*quinquemaculata*, 177, 182.  
*quingervittata*, 174.  
*salvini*, 179.  
*septemmaculata*, 600, 609.  
*sextplagiata*, 180, 182.  
*steinheili*, 179, 182.  
*tredecimmaculata*, 177.  
*variegata*, 175, 182.
- Estrelata**  
*armenjoniana*, 163.  
*mollis*, 164.  
*philippi*, 164.  
*trinitatis*, 163.
- Ophideres**  
*fullonica*, 679.
- Ophiusa**  
*arcuata*, 679.  
*sinillima*, 679.
- Ophiocephalus**  
*aurantiacus*, 230.  
*gachua*, 225.  
*indicus*, 225.  
*montanus*, 225.  
*punctatus*, 225.  
*striatus*, 230.
- Ophiodes**  
*cuprea*, 679.  
*triphanoides*, 679.
- Oreas**  
*canna*, 307.
- Ornithion**  
*imberbe*, 202.
- Ortygis**  
*lepurana*, 491.
- Ortygometra**  
*cinerea*, 577.
- Oryx**  
*leucoryx*, 307.
- Osculatia**  
*sapphirina*, 155.
- Ossifraga**  
*gigantea*, 165.
- Otaria**  
*gillespii*, 420.
- Otis**  
*afraoides*, 491.
- Otis**  
*ruficrista*, 491.  
*tarda*, 488.
- Otoeyon**  
*lalandii*, 257, 258, 259, 260, 261, 262, 263, 288.
- Otolienus**  
*senegalensis*, 303.
- Ouakaria**  
*calvus*, 645.  
*melanocephala*, 645, 647.  
*rubicunda*, 646, 647.  
*spixii*, 638, 645.
- Ovis**  
*anatolica*, 59.  
*aries*, 308.  
*burrhel*, 186.  
*campestris*, 308.  
*cyprinus*, 59.  
*gmellini*, 55, 56, 57, 58, 59.  
*musimon*, 59, 307.  
*ophion*, 55, 59.  
*orientalis*, 59.  
*strepsiceros*, 307.
- Pachyrhamphus**  
*albogriseus*, 203.
- Pagodina**  
*pagodula*, 130.
- Paladilhia**  
*pleurotoma*, 138.
- Palaeolampas**  
*crassa*, 48, 49, 357.
- Palaeornis**  
*alexandri*, 309.  
*poulicerianus*, 310.  
*torquatus*, 309.
- Paludina**  
*colbeaui*, 216, 219.  
*spekei*, 484, 485.
- Pamphila**  
*bada*, 669.  
*bevani*, 669.  
*masa*, 670.  
*matthias*, 669.  
*sunias*, 669, 670.
- Pandora**  
*brevis*, 580.  
*striata*, 579.
- Panoplitis**  
*matthewsi*, 204.
- Papilio**  
*albinus*, 614.  
*ariadne*, 667.  
*baticus*, 406.  
*cardui*, 406.  
*chryseis*, 669.  
*chrysippus*, 405.
- Papilio**  
*daphidice*, 410.  
*drusia*, 637.  
*erithonius*, 669.  
*erymanthis*, 657.  
*fausta*, 409.  
*folus*, 669.  
*goldiei*, 613, 614.  
*hecabe*, 668.  
*leda*, 666.  
*lesches*, 614.  
*leucothoe*, 613.  
*limniaca*, 666.  
*mesentina*, 409.  
*mineus*, 667.  
*missippus*, 667.  
*plerippus*, 405.
- Paradijsca**  
*papuana*, 420.
- Paradoxurus**  
*typus*, 304.
- Parmacella**  
*palliorum*, 290.  
*valenciennii*, 290.
- Parmarion**  
*extraneus*, 292.  
*infumatus*, 292.  
*problematica*, 292.  
*pupillaris*, 292.  
*rangianus*, 292.  
*rubrum*, 292.
- Paroaria**  
*cucullata*, 318.  
*dominicana*, 313.
- Passer**  
*montanus*, 194.
- Pastor**  
*roseus*, 311.
- Pauxis**  
*galeata*, 648.
- Pelecanus**  
*crispus*, 318.  
*nitratu*, 420.  
*onocrotalus*, 318, 420.
- Pelochyta**  
*rhodopa*, 670.
- Peloperdix**  
*rubrirostris*, 16.
- Pempelia**  
*zinkenella*, 689.
- Perameles**  
*lagotis*, 305.  
*obesula*, 355.
- Perdix**  
*coqui*, 491.  
*levallantoides*, 491.  
*sephaena*, 491.  
*swainsonii*, 491.
- Perga**  
*bella*, 373.  
*bicolor*, 361, 371.

- Perga*  
*brullei*, 364, 379.  
*cameronii*, 367, 379.  
*christii*, 366, 379.  
*cressonii*, 368, 379.  
*dahlbomii*, 371, 379.  
*dalmani*, 369, 379.  
*dorsalis*, 360, 361, 362, 379.  
*esenbeckii*, 365, 379.  
*eucalypti*, 362.  
*ferruginea*, 361, 373, 374, 376.  
*foersteri*, 368, 379.  
*gravenhorstii*, 366, 379.  
*guerini*, 367, 379.  
*halidai*, 359, 377, 379.  
*hartigii*, 369.  
*jurinei*, 359, 378, 379.  
*kirbii*, 361, 371, 377, 379.  
*klugi*, 363, 379.  
*latreillii*, 361, 372, 379.  
*leachii*, 359, 377.  
*lewisi*, 360, 361, 374, 375.  
*macleanii*, 372, 379.  
*mayrii*, 359, 378, 379.  
*newmanni*, 370.  
*pelotierii*, 370, 379.  
*polita*, 361, 363.  
*ritsemei*, 365, 379.  
*scabra*, 376.  
*schiodtei*, 361, 364, 379.  
*scutellata*, 362.  
*smithii*, 375, 379.  
*spinola*, 371, 379.  
*ventralis*, 373, 376.  
*vollenhovii*, 365, 379.  
*walkerii*, 361, 368, 379.  
 (Pseudoperga) *ventralis*, 376.
- Perigea*  
*dolorosa*, 676.  
*illecta*, 676.
- Petasophora*  
*anis*, 204.
- Phacellodomus*  
*frontalis*, 200.
- Phaethornis*  
*griseogularis*, 204.
- Phaeton*  
*candidus*, 577.  
*flavirostris*, 163.  
*rubricauda*, 577.
- Phakellura*  
*indica*, 685.
- Phalacrocorax*  
*capensis*, 163.  
*carbo*, 318.
- Phalæna*  
*ammonia*, 679.  
*lotrix*, 671.  
*mygdon*, 679.  
 (Noctua) *archesia*, 680.  
 (—) *hyppasia*, 680.  
 (—) *virbia*, 680.  
 (Pyralis) *fascialis*, 683.  
 (Tinea) *entella*, 671.
- Phaps*  
*chalcopetra*, 314.
- Phascolarectus*  
*cinereus*, 355.
- Phascologale*  
*crassicaudata*, 459.  
*lanigera*, 454, 455, 459.  
*penicillata*, 458, 459.
- Phascolumys*  
*wombat*, 305.
- Phasianus*  
*colchicus*, 420.  
*reevesi*, 420.
- Pheucticus*  
*chrysogaster*, 199.  
*chrysopheplus*, 199.
- Philepitta*  
*castanea*, 387, 388.
- Phissama*  
*transiens*, 670.
- Phlogoenas*  
*erythroptera*, 576.
- Phlogopsis*  
*erythroptera*, 155.
- Phoca*, sp. inc., 54.  
*vitulina*, 304.
- Phœnicopterus*  
*antiquorum*, 446.
- Phrygilus*  
*gagyi*, 199.
- Phyllomyias*  
*tumbezana*, 202.
- Phyllornis*  
*media*, 14.
- Phylloscopus*  
*borealis*, 14, 15.
- Phyllostoma*  
*hastatum*, 395.
- Phycis*  
*zinkenella*, 689.
- Physa*  
*lirata*, 617, 619.
- Physcænura*  
*panda*, 183.  
*pione*, 183, 185.
- Picolaptes*  
*lacrymiger*, 201.
- Pieris*  
*formosana*, 669.  
*iranica*, 410.  
*luconiensis*, 668.  
*ornytion*, 613, 614.  
*vipasa*, 410.
- Piezorhina*  
*cinerea*, 199.
- Pipreola*  
*scilateri*, 155.
- Pipridea*  
*melanonota*, 146.
- Pitasila*  
*bijunctella*, 672.  
*guttulosa*, 673.  
*inconstans*, 672, 673.  
*leucospilata*, 673.
- Pithecia*  
*alba*, 646.  
*calva*, 646.  
*chiropotes*, 643, 644, 645.  
*melanocephala*, 645.  
*monachus*, 394, 634, 636, 642, 643.  
*rubicunda*, 646.  
*satanus*, 629, 631, 634, 636, 637, 643, 644.
- Pithys*  
*melanosticta*, 160.
- Pitta*  
*cyanura*, 388.  
*melanocephala*, 388.
- Pitylus*  
*fuliginosus*, 146.
- Plagiodera*  
*quadrinaculata*, 171.  
*seamaculata*, 595, 608.
- Planorbis*  
*guadelupensis*, 349.  
*sudanicus*, 345, 349.
- Platalea*  
*leucorodia*, 316.
- Platyceurus*  
*eximius*, 310.  
*pullidiceps*, 310.  
*pennanti*, 310.  
*zonarius*, 310.
- Platyrhynchus*  
*rostratus*, 156.
- Platyrhynchus*  
*senex*, 156.
- Plecoptera*  
*dolosa*, 678.
- Plectropterus*  
*gambensis*, 316, 498, 534.  
*niger*, 498, 534.  
*rueppelli*, 498, 534.
- Plectrurus*  
*aureus*, 182.

- Pleiodon  
*spekei*, 344, 350.
- Plesioneura  
*folius*, 669.
- Plocepasser  
*mahali*, 491.
- Ploceus  
*dubius*, 491.  
*tahatali*, 491.
- Plusia  
*ochreata*, 677.  
*verticillata*, 677.
- Podabrus  
*macrourus*, 459.
- Podargus  
*cuvieri*, 472.
- Pœcilodryas  
*æthiops*, 65, 66.
- Pœcilothraupis  
*lacrymosa*, 194.  
*palpebrosa*, 194.
- Poephagus  
*grunniens*, 308.
- Polioptila  
*nigriceps*, 191.
- Polyommatus  
*sangra*, 668.  
*varunana*, 667.
- Polysticte  
*quopopa*, 491.
- Pomatias  
*herculeus*, 139, 140,  
 142.  
*patulus*, 101, 139.  
*septemspiralis*, 139,  
 140.  
*simonianus*, 140.
- Pontia  
*mannii*, 411.  
*niobe*, 668.
- Poroppleura  
*celestina*, 591, 608.
- Porphyrio  
*cæruleus*, 315.  
*poliocephalus*, 315.
- Porthetria  
*bhascara*, 673.
- Porzana  
*albigularis*, 161.  
*ænops*, 161.
- Pratincola  
*bimaculata*, 66.  
*caprata*, 66.
- Precis  
*actia*, 185.  
*amestris*, 185.
- Priodontes  
*maximus*, 402.
- Prion  
*desolatus*, 165.  
*vittatus*, 165.
- Prionodera  
*elegans*, 591, 608.
- Prionops  
*talacoma*, 490.
- Procellaria  
*conspicillata*, 164.  
*gigantea*, 165.  
*hastata*, 164.  
*mollis*, 164.
- Procyon  
*lotor*, 304.
- Prodenia  
*glaucistriga*, 676.  
*infecta*, 676.  
*retina*, 676.
- Proscicela  
*bicruciatæ*, 596, 608,  
 609.  
*flavipennis*, 595, 608.  
*simplicipennis*, 595,  
 608, 609.  
*spectabilis*, 595, 608.
- Protoparce  
*orientalis*, 670.
- Psarisomus  
*dalhousiæ*, 381.
- Pseudadia  
*albistrigella*, 89, 93.  
*arctostaphylella*, 88,  
 89, 93.  
*bipunctella*, 88.  
*chrysopyga*, 88, 90.  
*cupreonivella*, 86, 93.  
*erminecella*, 90, 93.  
*hockingella*, 90, 93.  
*monticola*, 87, 90, 93.  
*notatella*, 85.  
*semilugens*, 85.  
*subcærulea*, 89, 93.  
*xanthorrhœa*, 85.
- Psephotus  
*pulcherrimus*, 310.
- Pseudocolaptes  
*boissonneaui*, 200.
- Psittacula  
*cana*, 310.  
*celestis*, 211.
- Pterocles  
*gutturalis*, 491.  
*variegatus*, 491.
- Pteroglossus  
*torquatus*, 314.
- Pteromys  
*momoga*, 305.
- Pteronura  
*sandbachii*, 396, 402.
- Pterophanes  
*temmincki*, 204.
- Pteropus  
*medius*, 303.  
*samoensis*, 11.
- Pteruthius  
*æralatus*, 16.  
*cameranoi*, 16.
- Ptilochlorus  
*buckleyi*, 158.  
*remigialis*, 158.  
*squamata*, 158.
- Ptilopus  
*fasciatus*, 577, 578.  
*hernsheimi*, 577.  
*ponapensis*, 576, 578.
- Puffinus  
*obscurus*, 577.
- Pupa  
*angusta*, 128.  
*biplicata*, 128.  
*bourguignatiana*, 128.  
*caféicola*, 215, 219.  
*ferraria*, 130.  
*grimaldiensis*, 129.  
*micheli*, 127.  
*multidentata*, 100, 126.  
*obesa*, 127.  
*obliqua*, 101.  
*plagiostoma*, 128, 129,  
 142.  
*polita*, 126.  
*præclara*, 129, 142.  
*præhistorica*, 125.  
*quinquedentata*, 98, 99,  
 100.  
*ressmanni*, 128.  
*speluncarum*, 125.  
*toscanæ*, 128.  
*tumida*, 128.  
*usambarica*, 218, 219.  
*variabilis*, 125.  
 (Oracula) *doliolum*, 127.  
 (Pupilla) *muscorum*,  
 124.  
 (—) *umbilicata*, 124.  
 (Sphyradium) *auste-*  
*niæna*, 130, 142.  
 (—) *bourguignati-*  
*ana*, 127, 142.  
 (—) *polyana*, 129,  
 142.  
 (Torquilla) *avenacea*,  
 127.  
 (—) *grana*, 127.  
 (—) *multidentata*,  
 125.  
 (—) *obliqua*, 126, 142.  
 (—) *quinquedentata*,  
 99, 125.  
 (—) *secale*, 127.  
 (—) *psarolena*, 124.  
 (Vertigo) *minutissima*,  
 124.  
 (—) *sinistrorsa*, 618,  
 619.

- Purpura anomala*, 415.  
*Pyrallis*  
*sp. inc.*, 682.  
*farinalis*, 682.  
*tenuis*, 681.  
*thermusalis*, 682.  
*Pyrameis*  
*cardui*, 406.  
*Pyrausta*  
*azaræ*, 195.  
*erythromelana*, 146.  
*rubra*, 312.  
*rubriceps*, 195.  
*Pyrausta*  
*absistalis*, 682.  
*Pyrgita*  
*diffusa*, 491.  
*motitensis*, 491.  
*Pyrocephalus*  
*rubineus*, 203.  
*Pyrrhocorax*  
*alpinus*, 312.  
*Pytelia*  
*cinereigula*, 476, 477.  
*citerior*, 477.  
*melba*, 477.  
*wieneri*, 476, 477.  
*Quelea*  
*sanguinirostris*, 313.  
*Querquedula*  
*andium*, 522.  
*brasiliensis*, 523.  
*carolinensis*, 521.  
*circia*, 317, 520, 534.  
*crecca*, 317, 521, 534.  
*cyanoptera*, 522.  
*discors*, 521.  
*eatonii*, 523.  
*falcata*, 521.  
*flavirostris*, 522.  
*formosa*, 521.  
*gibberifrons*, 519.  
*hartlaubii*, 522, 534.  
*hottentotta*, 522.  
*cryptera*, 212, 522.  
*puna*, 522.  
*punctata*, 522, 534.  
*torquata*, 522.  
*versicolor*, 522.  
*Quiscalus*  
*lugubris*, 311.  
*Rallus*  
*cæsius*, 213.  
*celebensis*, 66.  
*insignis*, 65, 66.  
*pectoralis*, 65.  
*rythyrhynchus*, 213.  
*sulcirostris*, 66.  
*Ramphastos*  
*ambiguus*, 356.  
*ariel*, 313.  
*dicolorus*, 314.  
*piscivorus*, 314.  
*tocard*, 356.  
*Ramphocelus*  
*brasilius*, 146, 312.  
*jacapa*, 146.  
*Ramphomicon*  
*microrhynchum*, 207.  
*ruficeps*, 207.  
*Rana*  
*bufo*, 569.  
*esculenta*, 571, 621.  
*marmorata*, 571.  
*mosaica*, 560, 564.  
*rubeta*, 569.  
*variabilis*, 553.  
*Rangifer*  
*tarandus*, 306.  
*Recurvirostra*  
*avocetta*, 316.  
*Reithrodon*  
*alstoni*, 691, 692, 693, 694, 695, 696.  
*chinchilloides*, 691, 692, 694, 695, 696.  
*cuniculoides*, 691, 692, 694, 695.  
*typicus*, 691, 694, 695.  
*Remigia*  
*archesia*, 680.  
*frugalis*, 680.  
*gregalis*, 680.  
*optativa*, 680.  
*virbia*, 680.  
*Renea*  
*bourguignatiana*, 138, 142.  
*Rhea*  
*americana*, 315.  
*Rhinoceros*  
*bicornis*, 420.  
*keilloa*, 490.  
*sondaicus*, 420.  
*sumatrensis*, 69, 188.  
*Rhinolophus*  
*petersi*, 462.  
*Rhipidura*  
*albicollis*, 16.  
*atrata*, 16.  
*fusciventris*, 16.  
*Rhodonessa*  
*caryophyllacea*, 520, 534.  
*Rhoicus*  
*maculicollis*, 600, 609.  
*trifasciatus*, 600.  
*Rhynchæa*  
*capensis*, 15.  
*Rhynchaspis*  
*capensis*, 523.  
*Rissoina*  
*crassa*, 416.  
*elegantula*, 417, 420.  
*lirata*, 417, 450.  
*Rita*  
*buchanani*, 231.  
*Rumina*  
*decollata*, 98, 100, 101.  
*Rupela*  
*degenerella*, 690.  
*Rupicapra*  
*tragus*, 307.  
*Salix*  
*humboldti*, 189.  
*Salmacis*  
*bicolor*, 427, 428, 431.  
*conica*, 431.  
*dussumieri*, 427, 429.  
*globator*, 427, 431, 432, 440.  
*rarispinga*, 427, 429.  
*sulcata*, 427, 430, 431.  
*Saltator*  
*albicollis*, 198.  
*laticlavus*, 198.  
*magnus*, 146.  
*Samea*  
*dives*, 682.  
*Sarcidiornis*  
*africana*, 510, 534.  
*carunculata*, 510, 511.  
*melanonota*, 510, 511.  
*melanota*, 534.  
*Sarcoramphus*  
*gryphus*, 303.  
*Satyris*  
*brahminus*, 147.  
*parisatis*, 405.  
*Scaphiodon*  
*aculeatus*, 227, 231.  
*irregularis*, 225, 226, 230, 231.  
*microphthalmus*, 225, 227, 231.  
*walceni*, 229, 230, 231.  
*Scardamia*  
*metallaria*, 686.  
*Schismaderma*  
*carens*, 567.  
*lateralis*, 567.  
*Schistochlamys*  
*speculigera*, 198.  
*Schizostoma*  
*megalote*, 464.

- Scirpophaga  
   *degenerella*, 690.  
   *pralata*, 690.  
 Sciuropterus  
   *volucella*, 305.  
 Sciurus  
   *astuans*, 393, 400, 401.  
   *astuans*, var. *hoffmanni*,  
     401.  
   *cepapi*, 490.  
   *cinereus*, 304.  
   *griseogenys*, 393, 400,  
     401.  
   *hoffmanni*, 401.  
   *hudsonius*, 304.  
   *stramineus*, 400.  
   *syriacus*, 59.  
   *variatus*, 305.  
   *vulgaris*, 304.  
   *vulpinus*, 305.  
 Scolitantides  
   *cashmirensis*, 408.  
 Scopus  
   *umbretta*, 537.  
 Scytalopus  
   *magellanicus*, 202.  
 Secusio  
   *distincta*, 672.  
   *mundipicta*, 672, 673.  
   *strigata*, 673.  
 Semnopithecus  
   *nasalis*, 69.  
 Sepia  
   *inermis*, 354.  
   *officinalis*, 354.  
 Serilophus  
   *rubropygius*, 381.  
 Serpophaga  
   *albogrisea*, 156.  
   *cineca*, 156, 203.  
 Sesamia  
   *tranquillaris*, 674.  
 Sesara  
   *infrendens*, 289.  
 Setophaga  
   *bairdi*, 192.  
 Sialia  
   *wilsoni*, 311.  
 Sieboldia  
   *maxima*, 544.  
 Sigmodon  
   *hispidus*, 692, 693, 696.  
 Silurus  
   *anastomus*, 225.  
   *kuggur*, 225, 231.  
   *lamghur*, 225.  
 Simæthis  
   *pronubana*, 687.  
 Simia  
   *caraya*, 394.  
   *melanocephala*, 645.  
   *satyrus*, 301.  
 Siren  
   *lacertina*, 544.  
 Sirystes  
   *albogriseus*, 156.  
 Smerinthus  
   *kindermanni*, 413.  
   *ocellatus*, 414.  
 Somateria  
   *mollissima*, 528.  
   *spectabilis*, 528.  
   *v-nigrum*, 528.  
 Sorex  
   *concolor*, 490.  
 Spalax  
   *typhlus*, 64.  
 Spatha  
   *alata*, 351.  
   *tanganyicensis*, 350, 352.  
 Spatula  
   *capensis*, 523, 534.  
   *clypeata*, 523, 534.  
   *platalea*, 523.  
   *rhynchotis*, 523, 535.  
   *variata*, 523, 535.  
 Spermophila  
   *gutturalis*, 199.  
   *obscura*, 199.  
   *simplex*, 199.  
 Spermophilus  
   *citillus*, 59, 305.  
   *xanthopymnus*, 59.  
 Sphenaceus  
   *galactodes*, 65.  
 Sphinx  
   *alecto*, 670.  
   *oldenlandiae*, 670.  
   *theyia*, 670.  
 Spilosoma  
   *transiens*, 670.  
 Spintherops  
   *phantasma*, 414.  
 Spirula  
   *australis*, 352, 354.  
   *reticulata*, 352.  
 Spizaetus  
   *nipalensis*, 67.  
   *orientalis*, 67.  
 Spodoptera  
   *erica*, 675.  
 Starnænas  
   *cycanocephala*, 314.  
 Steatornis  
   *caripensis*, 208.  
 Stellio  
   *caucasicus*, 620.  
 Stenia  
   *sp. inc.*, 683.  
   *ornatalis*, 683.  
 Stenogyra  
   *decollata*, 121.  
   (Rumina) *decollata*,  
     133.  
 Sterna  
   *bergii*, 577.  
   *macrura*, 163.  
   *melanotauchen*, 577.  
   *virgata*, 163.  
   *vittata*, 163.  
 Stictonetta  
   *navosa*, 513, 535.  
 Stictoplaea  
   *latifica*, 666.  
   *swinhoei*, 666.  
 Stilodes  
   *chapuisi*, 169.  
   *fuscolineata*, 170.  
   *steinheili*, 170, 182.  
 Strepsiceros  
   *kudu*, 538.  
 Strepsilas  
   *interpres*, 576.  
 Streptostyla  
   *flavescens*, 135.  
 Strix  
   *perlata*, 212.  
 Struthio  
   *camelus*, 315.  
 Sturnus  
   *unicolor*, 311.  
   *vulgaris*, 311.  
 Succinea  
   *delalandi*, 617.  
 Sula  
   *piscator*, 163.  
 Sus  
   *pliciceps*, 306.  
   *scrofa*, 54, 306.  
 Sycalis  
   *flaveola*, 199.  
 Synallaxis  
   *antisiensis*, 200.  
   *frontalis*, 200.  
   *fruticicola*, 200.  
 Synchloë  
   *daphidice*, 410.  
   *iranica*, 410, 415.  
 Syristes  
   *albocinereus*, 156.  
 Syrnum  
   *aluco*, 309.  
 Syrrhaptes  
   *paradoxus*, 314.  
 Systemus  
   *bimaculatus*, 225.  
   *canis*, 225.  
 Systropha  
   *ariflua*, 671.  
 Tachyeres  
   *cinereus*, 529.  
 Tachypetes  
   *aquila*, 577.  
 Tachyphonus  
   *coronatus*, 146.

- Tachyphonus  
   *cristatus*, 146.  
   *melaleucus*, 143, 145,  
     146.  
 Tadorna  
   *cana*, 512, 534.  
   *cornuta*, 511.  
   *radjah*, 511, 535.  
   *rutila*, 317, 511, 533,  
     534.  
   *scutulata*, 512, 534.  
   *tadornoides*, 512, 535.  
   *variegata*, 512, 535.  
   *vulpanser*, 317, 511,  
     534.  
 Talegalla  
   *lathamii*, 315.  
 Talpa  
   *mizura*, 441.  
   *wogura*, 441.  
 Tamandua  
   *longicaudata*, 403.  
 Tamias  
   *striatus*, 305.  
 Tanagra  
   *abbas*, 146.  
   *caelestis*, 195.  
   *darwinii*, 195.  
   *episcopus*, 146.  
   *ornata*, 146, 312.  
   *palmarum*, 146.  
   *sayaca*, 146.  
   *vittata*, 146.  
 Tanygnathus  
   *muelleri*, 310.  
 Taphrometopum  
   *lineolatum*, 620.  
 Tapirus  
   *bairdi*, 187.  
   *dowi*, 187.  
   *ecuadorensis*, 400.  
   *indicus*, 420.  
   *roulini*, 393, 400.  
 Tatobotys  
   *argillacea*, 686.  
 Tatusia  
   *kappleri*, 402.  
   *novemcincta*, 402.  
   *peba*, 402.  
 Tegenaria  
   *guyoni*, 420.  
 Teius  
   *rufescens*, 648.  
 Temnopleurus  
   *granulosus*, 423, 424,  
     425.  
   *hardwickii*, 423, 424,  
     426.  
   *reevesi*, 423, 424, 425.  
   *reynaudi*, 423, 424, 425.  
   *toreumaticus*, 423, 424,  
     425, 426, 429, 430.  
 Tenaris  
   *chionides*, 611.  
   *jamesi*, 611.  
 Teracolus  
   *farrinus*, 150.  
   *faustus*, 409.  
   *fulvia*, 149.  
   *tripunctatus*, 149,  
     152.  
 Terebra  
   *mariesi*, 480, 485.  
 Terenura  
   *callinota*, 159.  
   *humeralis*, 159.  
 Terias  
   *anemone*, 669.  
   *hecabe*, 668, 669.  
   *hobsoni*, 668, 669.  
   *unduligera*, 668, 669.  
 Terinos  
   *alurgis*, 612.  
   *terpander*, 612.  
 Testacella  
   *bisulcata*, 101.  
   *williamsiana*, 101, 142.  
 Tetrao  
   *tetrix*, 314.  
   *urogallus*, 314.  
 Thalassidroma  
   *melanogastra*, 164.  
   *wilsonii*, 164.  
 Thalassornis  
   *leuconota*, 529, 534.  
 Thamnophilus  
   *albinuchalis*, 201.  
   *subfasciatus*, 201.  
 Thaumasius  
   *taczanowskii*, 208.  
 Thaumastura  
   *cora*, 206.  
 Thecla  
   *birapa*, 149.  
   *icana*, 149.  
   *odata*, 149.  
   *syla*, 149.  
 Thermesia  
   *reticulata*, 680.  
 Thryothorus  
   *scoteri*, 191.  
 Thyroptera  
   *tricolor*, 395.  
 Tigrisoma  
   *salmoni*, 212.  
 Timandra  
   *avantiaria*, 687.  
 Tinea  
   *praelata*, 690.  
   *pulchella*, 414, 671.  
   *tapetzella*, 691.  
   *vinculella*, 92.  
 Tinnunculus  
   *alaudarius*, 308.  
 Tipanæa  
   *bipunctifera*, 690.  
 Tiphobia  
   *horei*, 344, 348, 352.  
 Toccus  
   *erythrorhynchus*, 313.  
 Todirostrum  
   *cinereum*, 202.  
 Toreumatica  
   *concava*, 427, 429.  
   *granulosa*, 425.  
 Tornatina  
   *brenchleyi*, 416.  
 Torquilla  
   *avenacea*, 101.  
   *secale*, 101.  
 Trachonitis  
   *punctigera*, 688.  
 Tragelaphus  
   *gratus*, 452.  
   *spekii*, 452.  
 Trichoglossus  
   *mitchelli*, 420.  
 Tricholais  
   *elegans*, 624.  
   *flavotorquata*, 624.  
 Trichothraupis  
   *quadricolor*, 146.  
 Trigonodes  
   *hyppasia*, 680.  
   *inacuta*, 680.  
 Triton  
   *cristatus*, 544.  
 Troglodytes  
   *audax*, 191.  
   *niger*, 420.  
 Trogon  
   *collaris*, 210.  
 Trophon  
   *stuarti*, 481, 485.  
 Trupialis  
   *loyca*, 200.  
 Tryptheromera  
   *plagifera*, 673.  
 Tubipora  
   *hemprichii*, 24, 25.  
 Turbo  
   *tridens*, 665.  
   (Pomaulax?) *taylori*  
     *anus*, 483, 485.  
 Turdinus  
   *marmoratus*, 15.  
 Turdus  
   *gigantodes*, 190.  
   *maranonicus*, 189.  
   *musicus*, 311.  
   *obscurus*, 15.  
   *pilaris*, 311.  
   *sibiricus*, 14, 15.  
   *viscivorus*, 190.  
 Turnix  
   *pugnax*, 15.

- Tylognathus  
*barbatulus*, 226.  
 Tyranniscus  
*nigricapillus*, 203.  
 Tyrannus  
*albigularis*, 28, 29.  
*apolites*, 28.  
*carolinensis*, 28.  
*dominicensis*, 28.  
*griseus*, 28.  
*luggeri*, 28.  
*melancholicus*, 28, 29,  
 30.  
*niveigularis*, 28, 29, 30.  
*pipiri*, 28.  
 Unio  
*burtoni*, 344.  
*caffer*, 618.  
*niloticus*, 345, 351.  
*parreyssii*, 351.  
*tanganyicensis*, 351,  
 352.  
 Upucerthia  
*serrana*, 200.  
 Uranomitra  
*cyanicollis*, 208.  
 Uromastix  
*acanthinurus*, 445.  
*fasciatus*, 445.  
*microlepis*, 445.  
*ornatus*, 445.  
*princeps*, 445.  
*spinipes*, 445.  
 Urotrichus  
*gibbsii*, 440, 441.  
*talpoides*, 440, 441,  
 443.  
 Ursus  
*americanus*, 442.  
*arctos*, 54, 304, 441,  
 442.  
*horribilis*, 442.  
*japonicus*, 442.  
*maritimus*, 304, 538.  
*ornatus*, 442, 443.  
*syriacus*, 54, 304.  
 Urubitinga  
*univincta*, 211.  
 Vespertilio  
*alcythoë*, 463.  
*aristippe*, 463.  
*leucippe*, 463.  
*nigricans*, 464.  
*savii*, 463.  
 Vesperugo  
*austrianus*, 464.  
*kuhli*, 51.  
*maurus*, 462, 463,  
 464.  
*mordax*, 464.  
*serotinus*, 50, 464.  
 Vidua  
*hypocherina*, 476.  
*nigerrima*, 476.  
*nitens*, 476.  
*principalis*, 475, 476.  
*splendens*, 475, 476.  
*superciliaris*, 476.  
 (Hypochera) *nitens*,  
 476.  
 Vireosylva  
*olivacea*, 192.  
 Vitrina  
*gigas*, 292, 294.  
*poepigii*, 615.  
*transvaalensis*, 615,  
 619.  
*vandenbroeckii*, 615,  
 619.  
 (Oligolimax), n. sp.,  
 102.  
 Volatinia  
*jacarina*, 199.  
 Voluta  
 (Aulica) *bednalli*, 418,  
 419.  
 Vulpes  
*bengalensis*, 286.  
*caama*, 286.  
*cinereo-argentatus*,  
 286.  
*corsac*, 287.  
*fulvus*, 286.  
*lagopus*, 286.  
*littoralis*, 286.  
*velox*, 286.  
*zerda*, 286.  
 Vultur  
*auricularis*, 308.  
*monachus*, 308.  
 Wallago  
*attu*, 230.  
 Xanthodes  
*impellens*, 676.  
 Xanthopygia  
*cyanomelana*, 14.  
 Xenorhynchus  
*senegalensis*, 316.  
 Xenurus  
*lugubris*, 402.  
 Xerophila  
*cespitem*, 100.  
*terveri*, 98, 99.  
 Yoldia  
*limatula*, 351.  
 Ypthima  
*lisandra*, 148.  
*ordinata*, 148, 152.  
 Zanclopteryx  
*fragilis*, 687.  
 Zebronia  
*abdicalis*, 684.  
 Zenaida  
*auriculata*, 213.  
 Zenaidura  
*carolinensis*, 314.  
 Ziphium  
*cavirostris*, 237.  
*novæ-zeelandiæ*, 232,  
 236, 237.  
 Zonites  
*algirus*, 101, 103,  
 104.  
*maceana*, 106.  
 Zonosoma  
*interlectum*, 673.  
 Zonotrichia  
*africana*, 491.  
*pileata*, 199.  
 Zosterops  
*semperi*, 575.

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